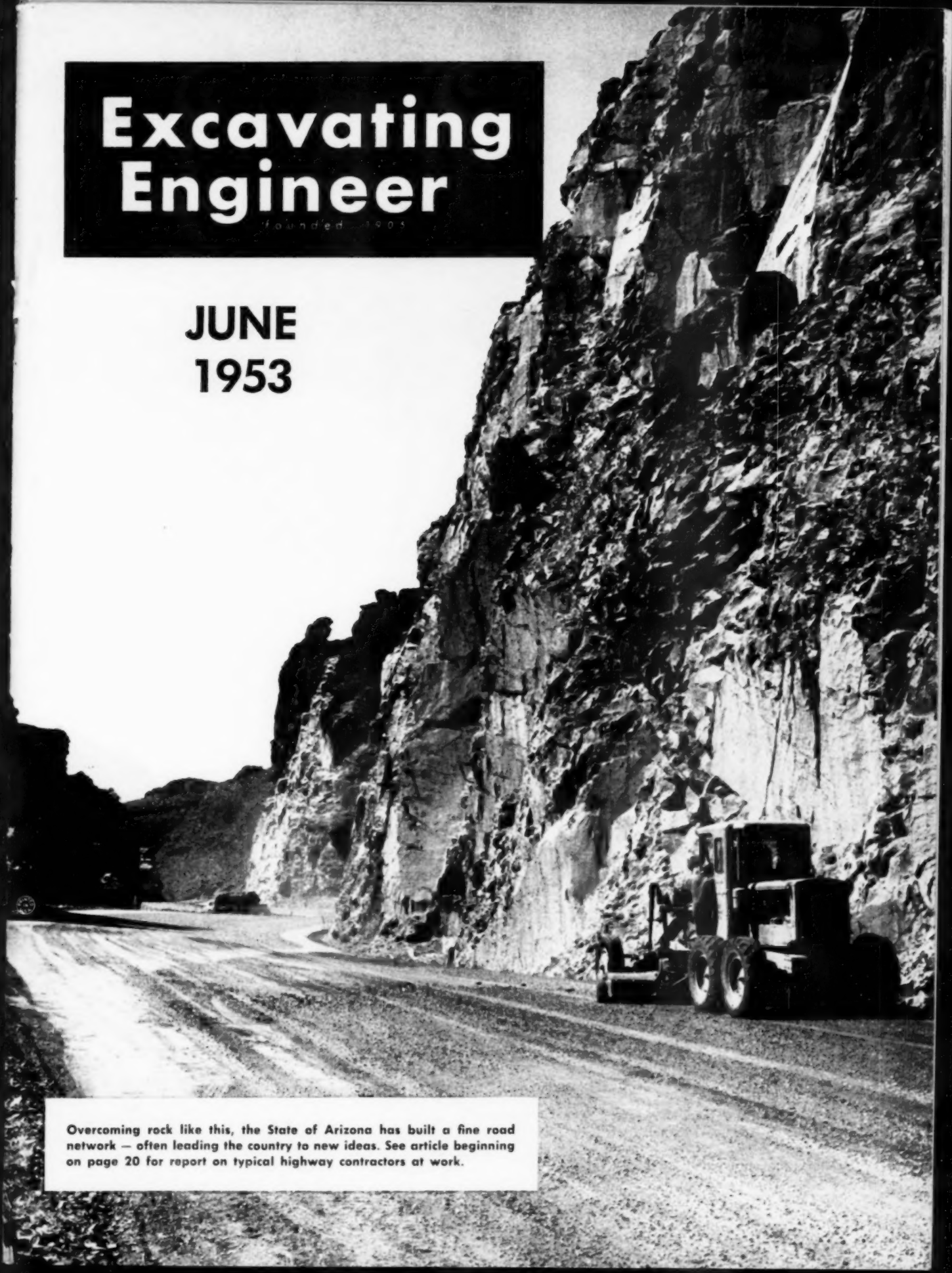
Excavating Engineer

founded 1905

JUNE 1953



Overcoming rock like this, the State of Arizona has built a fine road network — often leading the country to new ideas. See article beginning on page 20 for report on typical highway contractors at work.

there are

to build a line of excavators

1 THE EASY WAY . . .

. . . is to design a few basic machines, and then build up a line of additional models by adding extra counterweight, speeding up the engine, and hanging different size dippers on each.

Some of these machines will carry dippers too small. Output will be reduced, power wasted.

Other machines with dippers too large and counterweight too heavy will sweat and strain from overwork.

2 THE BUCYRUS-ERIE WAY

. . . is to design each excavator *individually* all the way through from crawler treads to boom point for a certain size payload.

Individual design means bigger loads on every bite, faster digging cycles, lower maintenance costs, longer machine life. All these add up to higher overall output, lower overall, costs. Compare *individually designed* Bucyrus-Eries with excavators in any other line before you buy. Ask your Bucyrus-Erie distributor to give you complete details on how individual design means bigger output for you.

9E53C

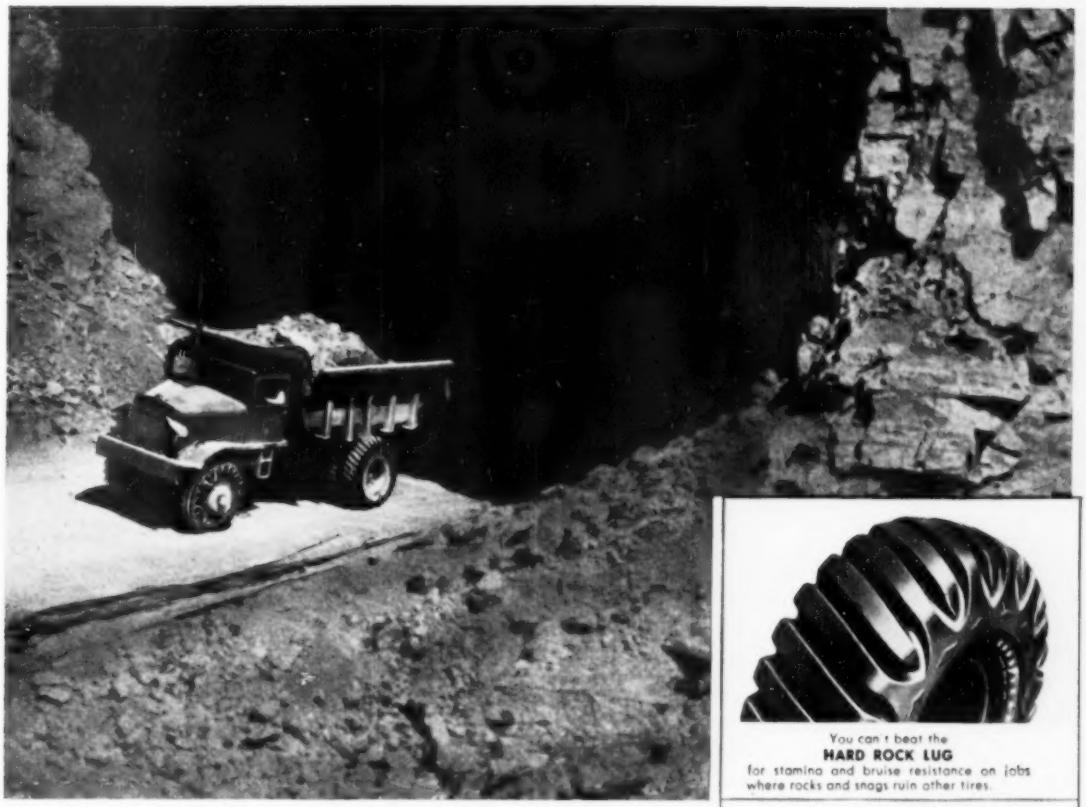
BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

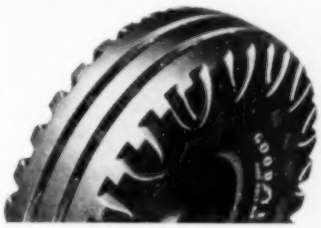
¾- to 4-yd. Gasoline, Diesel, Single Motor Electric Excavators

HYDROCRANE • HYDROHOE

THERE GO YOUR PROFITS-



You can't beat the
HARD ROCK LUG
for stamina and bruise resistance on jobs where rocks and snags ruin other tires.



You can't beat the
HARD ROCK RIB
for front wheels on all tire-killing service. Rugged—smooth rolling—easy steering.

You can't beat the
ROAD LUG
for toughness and traction OFF the road and long, smooth mileage ON the road.

AND WHETHER THEY GO into your pocket or out the window can well be decided by how your tires *work* and *stand up* under any and all conditions.

It takes loads of experience to build tires that can handle *any* job, day in, day out—and save you time and money—but Goodyear has what it takes. Goodyear has built over 580 MILLION pneumatic vehicle tires—more tires for more uses than anyone else on earth—and out of that unmatched practical experience come the continuous cost-saving improvements that mean so much to you. So pin your faith on Goodyear tires for every wheel on the job—and see what your equipment can really do!

Goodyear, Truck Tire Department, Akron 16, Ohio.

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE!

America Needs Better, Safer Roads — Let's Bring Them Up to PAR

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

Road Log—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

We think you'll like THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

You pick the job!

WHAT's the toughest blading operation you've got? Ditching? Bank-sloping? If you want to see it done better, easier, with more work output per hour, watch a Cat* Motor Grader handle it.

Watch the operator change through the full range of blade positions in one minute without leaving his seat! Get into the seat yourself! Notice how the operator has a full view of his work without standing up. Check the steady production with no stops for adjustment.

Your Caterpillar Dealer is ready to demonstrate any of the three models—No. 212, No. 112, or No. 12. Fair enough? Call him today.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

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Excavating Engineer

founded 1905

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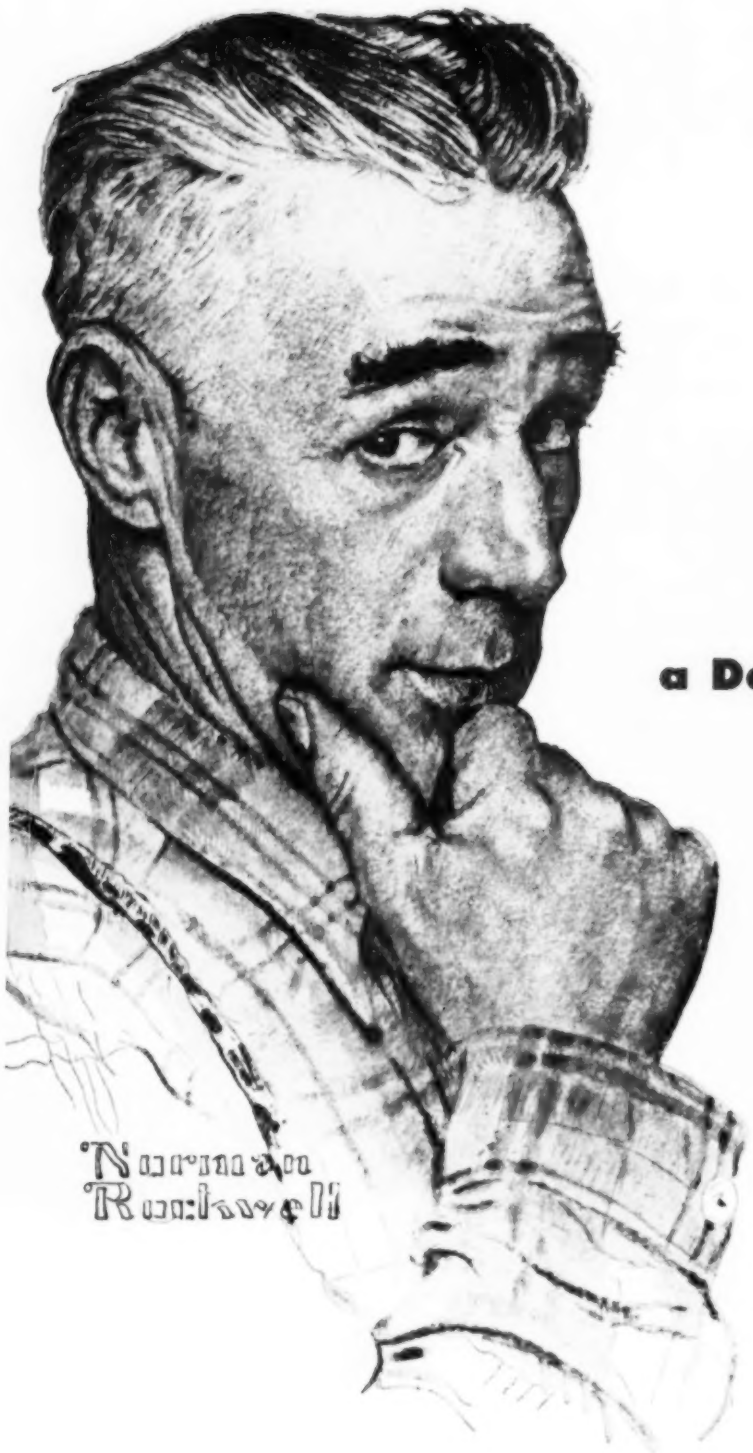


You?...

a Doubting Thomas?

IF YOU'RE a man who has to be shown, we're right in your corner. Just give Roebling "Blue Center" Steel Wire Rope one try . . . see for yourself how it saves time and costs you less on the job.

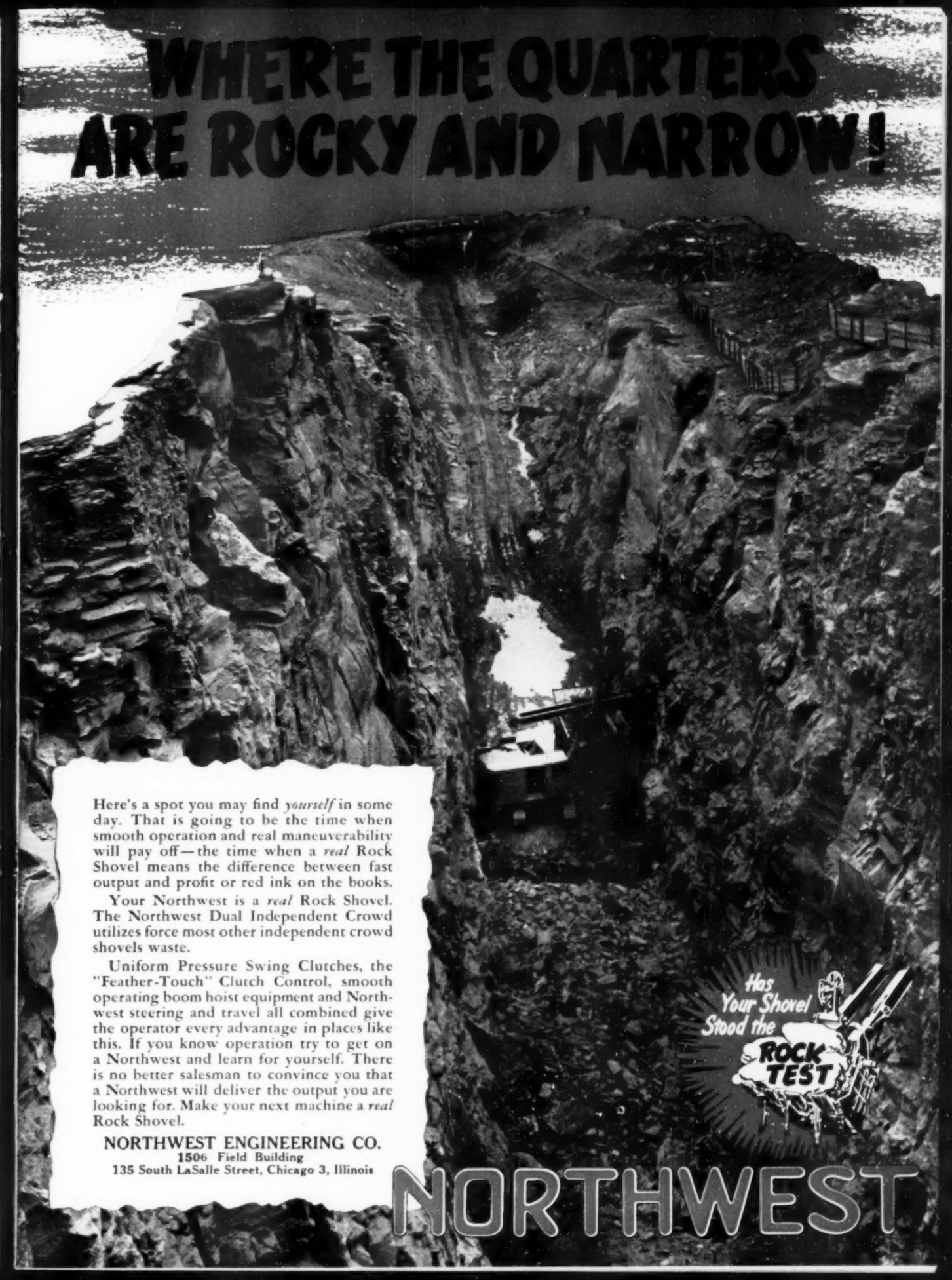
Two out of three wire rope users in excavating and construction prefer Roebling rope. Call the nearest Roebling office for a Field Man to suggest the best ropes for your purposes.

ROEBLING CF&I

A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE TRENTON 2, N. J.

WHERE THE QUARTERS ARE ROCKY AND NARROW!



Here's a spot you may find *yourself* in some day. That is going to be the time when smooth operation and real maneuverability will pay off—the time when a *real* Rock Shovel means the difference between fast output and profit or red ink on the books.

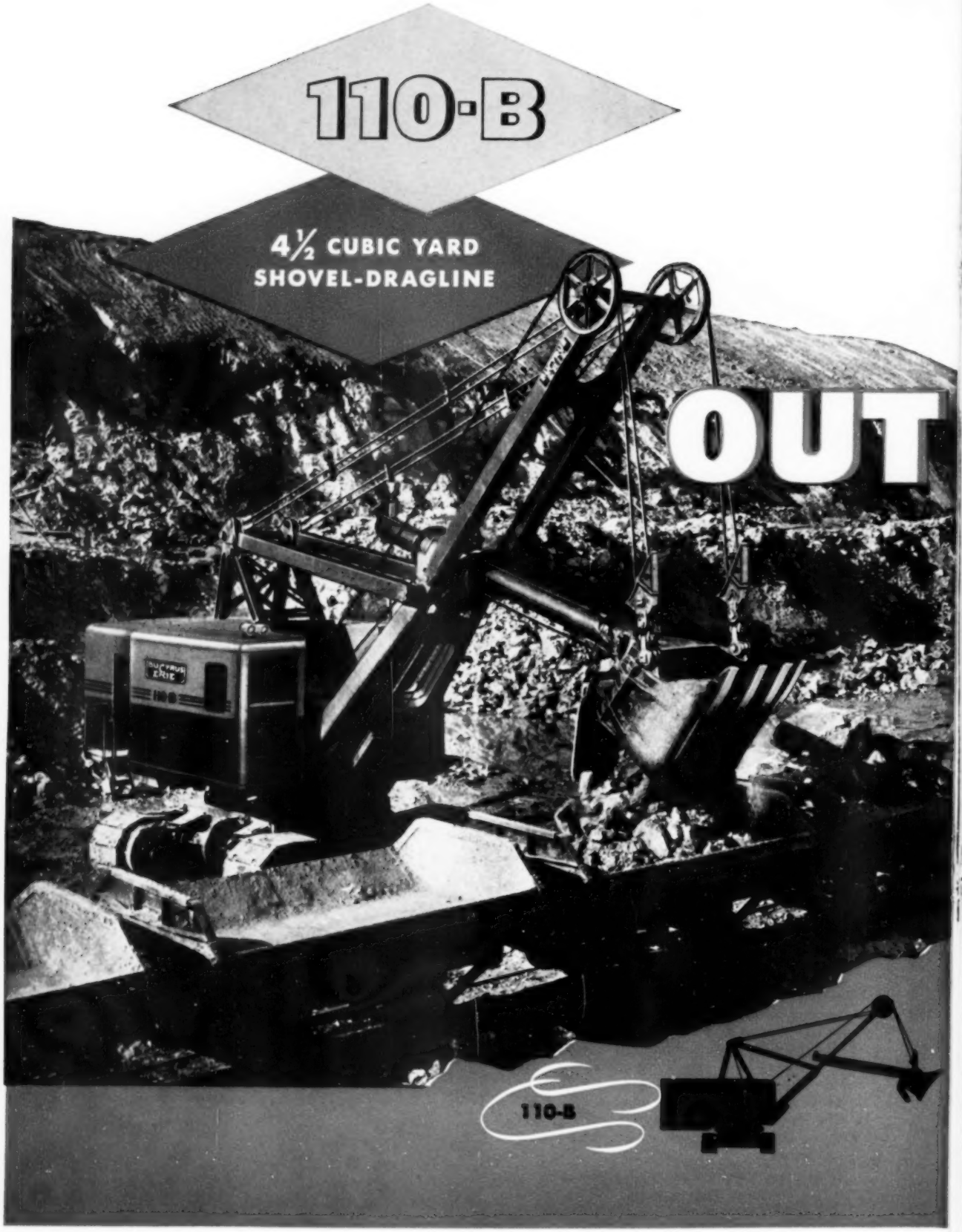
Your Northwest is a *real* Rock Shovel. The Northwest Dual Independent Crowd utilizes force most other independent crowd shovels waste.

Uniform Pressure Swing Clutches, the "Feather-Touch" Clutch Control, smooth operating boom hoist equipment and Northwest steering and travel all combined give the operator every advantage in places like this. If you know operation try to get on a Northwest and learn for yourself. There is no better salesman to convince you that a Northwest will deliver the output you are looking for. Make your next machine a *real* Rock Shovel.

NORTHWEST ENGINEERING CO.
1506 Field Building
135 South LaSalle Street, Chicago 3, Illinois

Has Your Shovel Stood the ROCK TEST

NORTHWEST


110-B
4½ CUBIC YARD
SHOVEL-DRAGLINE
OUT
110-B

another slugger in the PUT lineup

Now — taking its place in the outstanding line of Bucyrus-Erie heavy-duty quarry and mine excavators is the field-proved 4½-yard 110-B — a convertible shovel-dragline which can give you bigger output in rock, ore, or dirt at lower cost than any other machine of like capacity on the market today.

Like the larger 150-B (6-yard) and 190-B (8-yard) machines, the 110-B features Bucyrus-Erie's exclusive shovel front-end. The strong, light two-section boom reduces weight and speeds digging cycle, yet provides ample strength for tough digging. Tubular dipper handle, free to rotate in saddle block, permits digging with one corner of dipper without introducing torsional strains. Powerful effective rope crowd reduces swing inertia because crowd machinery is located on revolving frame. And, twin dual hoist ropes concentrate power where needed to pull dipper through toughest banks.

Before you buy any machine in the 4½-yard range, investigate the 110-B. It will give you consistently large output at lowest cost per yard. For detailed information, write today for Bulletin 110-B-1. 3153C

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

Another in the great modern line of Bucyrus-Erie quarry and mine excavators — yard for yard, dollar for dollar, pound for pound, the finest ever built.

EUCLID LEVER-TYPE SCRAPERS

for More Production and Lower Costs

15.5 cu. yds. struck — 18 cu. yds. heaped at 3:1 — 21 cu. yds. at 1:1

These Euclid Features mean more payloads per hour

- Stability and Safety of the 4-wheel tractor.
- Independent control of all Scraper operations.
- Lever actuated controls.
- Only 12 feet of cable.
- Simplified, compact hydraulic system with interchangeable jacks.
- Reversible, interchangeable cutting blades.
- 10-speed transmission . . . 28 m.p.h. with full payload.

Outperforms all other scrapers of comparable size!

Lever action, an exclusive Euclid development, is the most important advancement in Scraper design and performance in many years. Hydraulic jacks, each interchangeable with the other, operate levers that control the cutting edge, bowl and apron lift, and the positive roll-out ejector. No more down time due to broken cables . . . there is only one 12′ length of cable, used for the apron lift, on the scraper.

The choice of leading contractors because of their high job availability, "Euc" Scrapers are now better than ever in production and low cost performance! Ask your Euclid Distributor for information on this new model!

The EUCLID ROAD MACHINERY Co.

CLEVELAND 17, OHIO

CABLE ADDRESS, YUKLID. CODE: BENTLEY

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

Digs, hoists, swings fast...crawls smoothly

...with help of TIMKEN® bearings

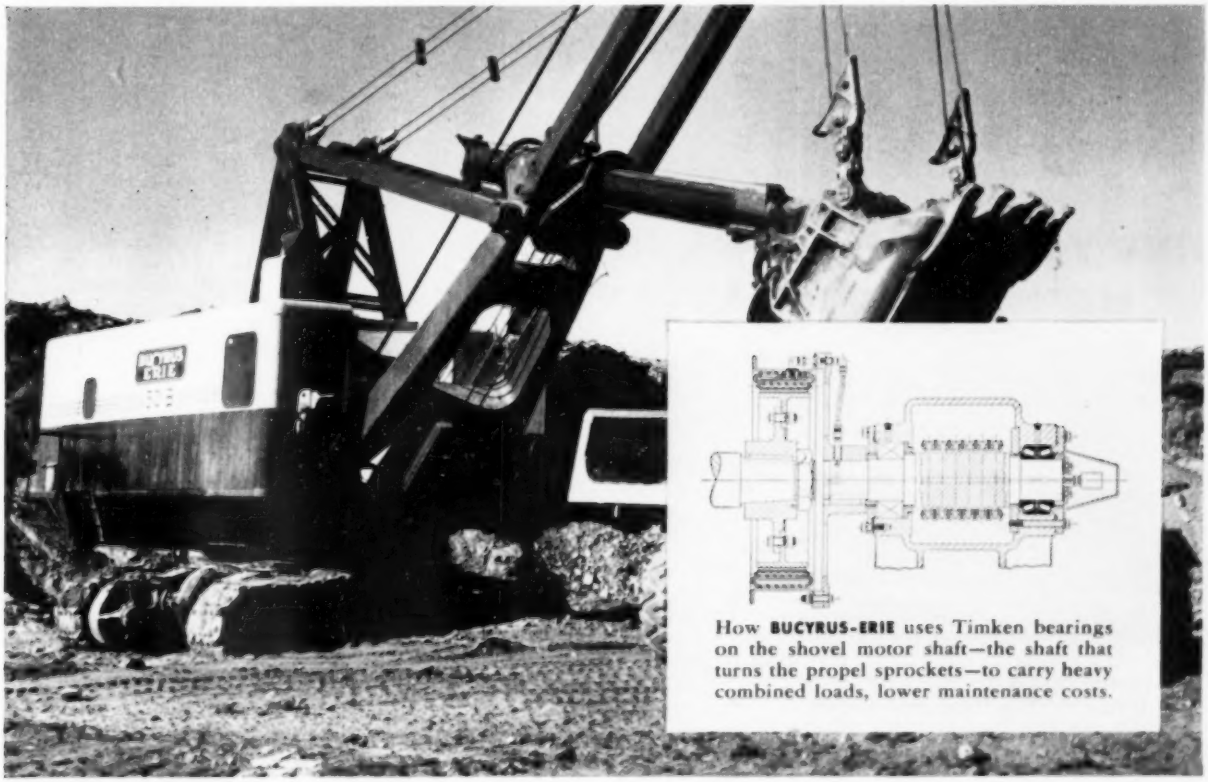
IN designing the 150-B shovel, Bucyrus-Erie engineers saw that in certain bearing locations the going would be particularly rough. The shaft that turns the big propel sprockets. The crowd gear. A hoist shaft, a pair of swing shafts, a pair of intermediate crowd shafts. The loads were heavy and they needed rugged and dependable bearings—so they specified Timken® tapered roller bearings.

The tapered rollers and races of Timken bearings enable them to carry radial and thrust loads in any combination. When a load hits the shaft, the bearings absorb it, yet continue to turn freely and frictionlessly.

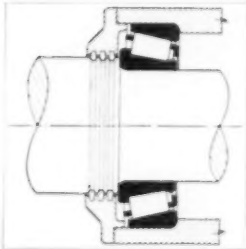
Because Timken bearings' case-hardened rollers and races have tough cores, they don't mind the shocks when digging in hard ground. Because they hold housings and shafts concentric, seals are more effective in keeping out dirt, dust and water—keeping lubricant in. Their long, trouble-free life is particularly important where parts are so inaccessible and repairs would be a big and costly operation.

If you build machines, specify Timken bearings; if you buy them, look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **BUCYRUS-ERIE** uses Timken bearings on the shovel motor shaft—the shaft that turns the propel sprockets—to carry heavy combined loads, lower maintenance costs.



LUBRICANT STAYS IN —DIRT KEPT OUT

Because Timken bearings hold shafts concentric with housings, closures are made more effective. Lubricant is retained, dirt and moisture kept out.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

TIMKEN

TAPERED ROLLER BEARINGS

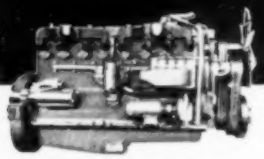
NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

BIG Displacement Buda Diesels

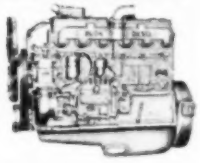
GIVE YOUR EQUIPMENT THESE MONEY-MAKING ADVANTAGES:

- $ 12 to 18% MORE HORSEPOWER at normal operating speeds . . . more reserve power for heaped loads
- $ 10 to 17% more useable torque . . . greater lugging ability . . . less shifting . . . faster round trips
- $ 6000 or more operating hours between overhauls . . . lower cost per hour of operation
- $ Exclusive Dyna-Swirl Combustion . . . more power per gallon of fuel . . . lower fuel cost
- $ Smooth, quiet operation . . . less exhaust fumes and smoke . . . less vibration . . . greater operator comfort and efficiency

Install or specify Buda Dyna-Swirl Diesels in your scrapers, dozers, trucks and tractors and get the *competitive edge* these powerful, long-life engines can bring you. There's a Buda Diesel for every type of earthmoving and construction equipment. See your Buda Engine Distributor for complete details.



8-DAS-1125 Supercharged
350 HP at 2100 RPM



6-DAS-844 Supercharged
280 HP at 2100 RPM

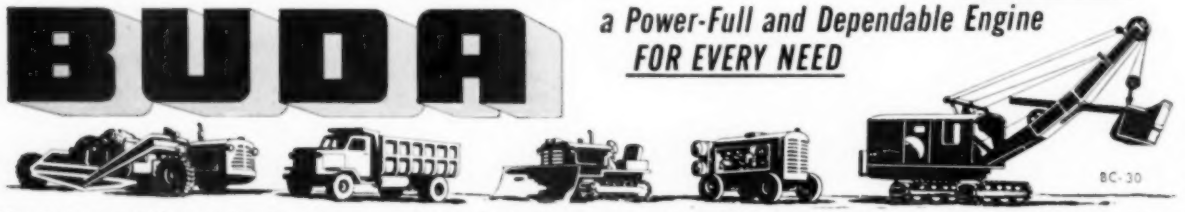
6-DA-779
185 HP at 2080 RPM

BUDA
COAST TO COAST
FACTORY EXPERIENCED SERVICE AND PARTS

WRITE FOR BULLETIN 1526 • THE BUDA COMPANY, HARVEY, ILLINOIS

BUDA

a Power-Full and Dependable Engine
FOR EVERY NEED



Manufacturers of Material Handling Equipment, Lifting Jacks, Maintenance of Way Products, Earth Drills and Diesel and Gasoline Engines

...PAYLOADER PAYS...

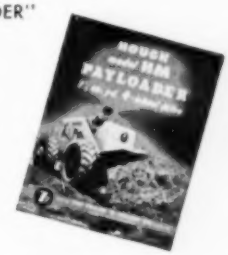
EVERYBODY concerned is pleased with the back-filling job John Rooff & Sons' "PAYLOADER" tractor-shovel is doing on this 12" water main installation. The contractor likes the 500 feet of daily progress being made . . . the water department knows it is getting a good solid back-fill . . . the highway department is sure the "PAYLOADER" will not damage the pavement.

Dig! Load! Backfill! Stockpile! Lift! Carry! Strip! Push! Pull! The "PAYLOADER" does *all* these jobs. That is why it is one of the busiest machines on any project — and the most in demand. There are eight sizes of "PAYLOADERS," also a choice of four-wheel, rear-wheel or front-wheel drive to best fit your needs.

"PAYLOADER" Distributors — some 200-strong in the U. S. and Canada — are ready to serve you with their modern parts department and service shops manned by experienced personnel. From ANY angle, it will pay to buy a "PAYLOADER" tractor-shovel — a *complete* unit built by the tractor-shovel pioneer, The Frank G. Hough Co., 708 Sunnyside Avenue, Libertyville, Illinois.

A SIZE FOR ANY JOB

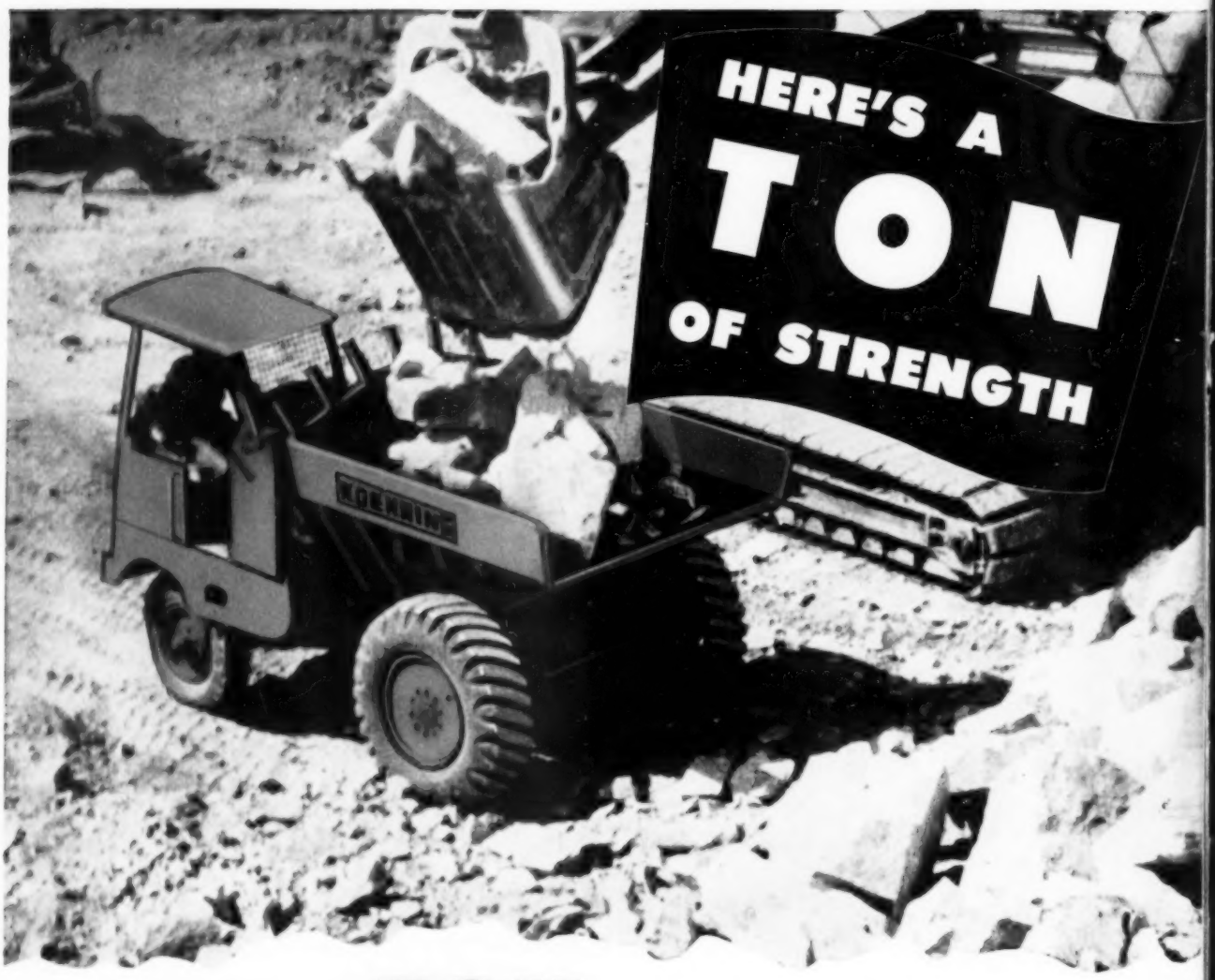
Full information on any "PAYLOADER" model is yours on request:
Four-Wheel drive Models HM — 1½ yd. and HR — 1 yd.;
Rear-wheel drive Models HY — 1¼ yd., HFH — 1⅛ yd., HF — ¾ yd., HE — ½ yd.;
Front-wheel drive Models HAH — ½ cu. yd., HA — 12 cu. ft.



SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920



FOR EVERY TON OF PAYLOAD . . .

When you're loading 1½ to 2½ yards of rock at a pass, hauling units need plenty of strength to last. With Koehring heavy-duty Dumptors, you have a ton of net vehicle weight for every ton of payload capacity. Sides, ends and bottom of all-welded 6-yard body are heavily reinforced with 4" channel ribs. Triple strength steel-oak-steel bottom cushions shocks of rock loading. Free swinging kick-out pan adds another tough steel plate to Dumptor bottom for extra strength.

There's plenty of strength, too, in the Dumptor chassis to take the constant pounding of heavy loading and rough off-road hauling. Heavily-trussed 8" ship channels make up the main frame. 4" chrome steel drive axles are protected by heavy-cast one-piece steel housing. "I"-beam steering axle is cast alloy steel. There are no leaf springs — just one big double-coil chassis spring on the steering axle — none on drive axle. Big drive tires eliminate need for more springs, absorb loading and hauling shocks, save spring maintenance.

Even with this heavy-duty construction, Koehring Dumptors have 6 HP per ton of gross weight — accelerate fast, pull through soft ground and up grades with less shifting — climb 24% grades fully loaded. For less down-time, more work-time, put heavy-duty Dumptors on your jobs.

CX139

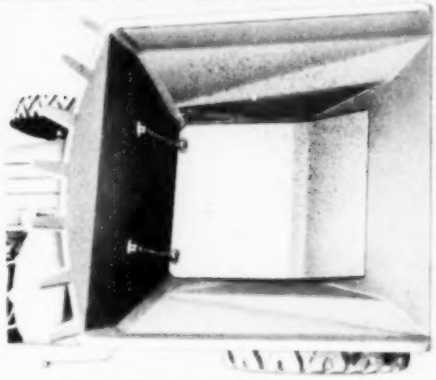
KOEHRING HEAVY DUTY

SEE YOUR KOEHRING DISTRIBUTOR FOR COMPLETE FACTS

KOEHRING DUMPTOR®

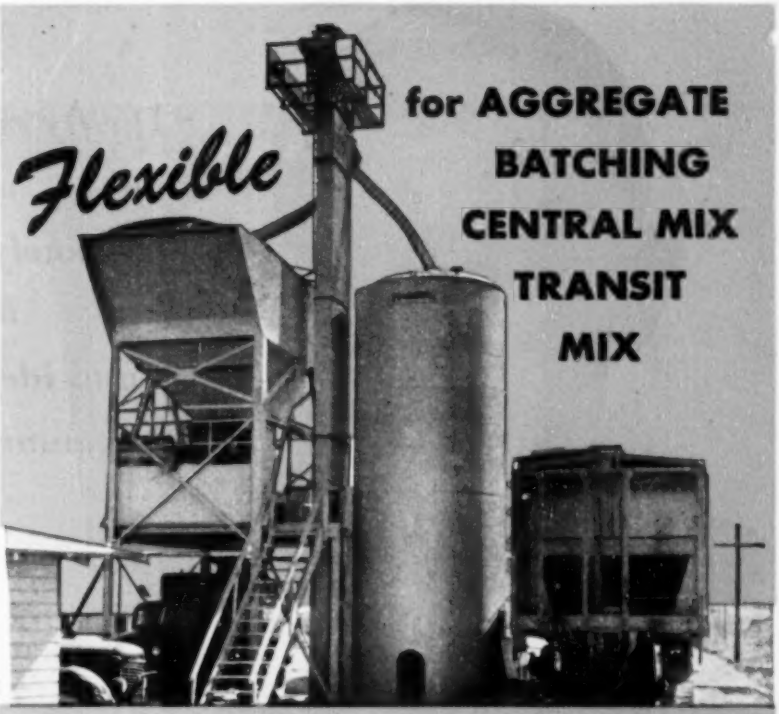
KOEHRING COMPANY, MILWAUKEE 16, WIS. • SUBSIDIARIES: • KWIK-MIX • PARSONS • JOHNSON

NO "SOFT SPOT" on Dumptor's underside . . . 1-piece, cast steel housing protects drive axle and enclosed chain drive. Wishbone supports the skid plate . . . shields the radius rod and the engine crank case . . . and supports the oscillating steering axle.



KICK-OUT PAN adds an extra 3/16" high-manganese steel plate on top of sturdy Dumptor bottom . . . breaks suction of sticky materials for fast, clean dump. Big 8' x 8' top gives easy-to-hit target for fast loading over the side or end . . . with less spillage.

1-SECOND GRAVITY DUMP . . . no slow-acting body hoists . . . no body-hoist maintenance . . . plus same speeds forward and reverse for no-turn shuttle hauling keep production yardage high, costs low with Dumptors.



Flexible for AGGREGATE BATCHING CENTRAL MIX TRANSIT MIX

Johnson All-Welded Roadbuilders Bin

Flexible Johnson Roadbuilders All-Welded Bin can be used as a portable batch plant for handling 2, 3 or 4 aggregates. This same bin readily converts to Transit-Mix Plant (illustrated), or to Central Mix, for handling bulk cement and 2 or 3 aggregates. It also can be equipped with 1 or 2 multiple-material Hi-Speed Batchers, size 34 Roadbuilders Batcher, or with a truck-mixer charging batcher in 2, 3 or 4-yd. sizes. Bin is available with 2, 3 or 4 compartments, 50 to 125 cu. yds. capacities. It has easy-charging 11' width, extra wide fill and discharge openings, steep 50° bottom slopes for fast flow. Your Johnson distributor can show you more production-boosting, cost-cutting features. See him for all sizes, types of mix plants, bins, batchers, silos, buckets, elevators, accessory equipment.

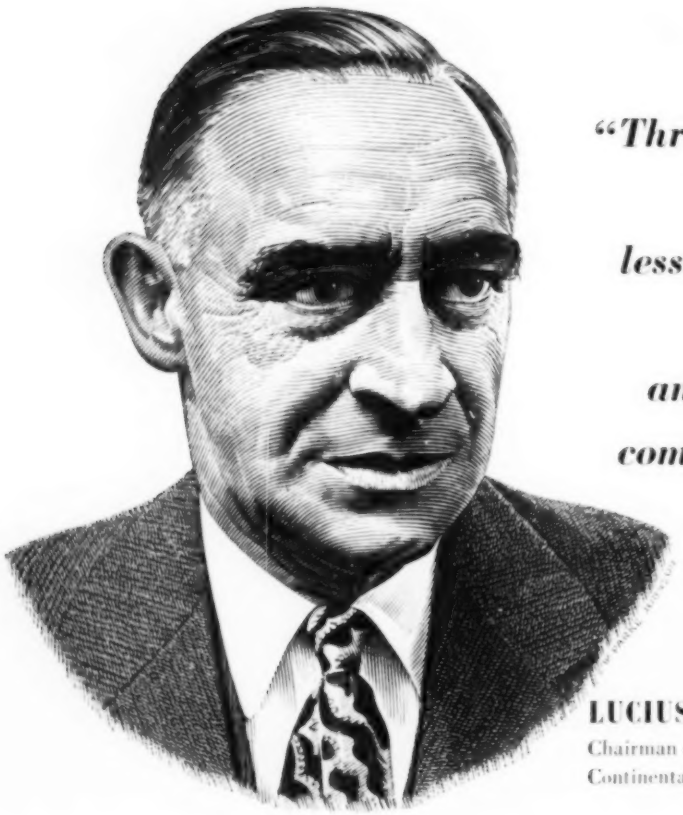
Get the most from Johnson Plants . . . use Koehring Mixers.

Also check Johnson for BIG PAYLOAD CLAMSHELLS

Heavy-duty Johnson Clamshell Buckets get capacity load every bite because all-welded construction lowers center of gravity, lets teeth dig in straight, deep. Big needle-bearing-mounted sheaves reduce friction power loss, deliver full digging power to teeth and lips. Hard manganese cutting edge welded to heavy lips gets tougher with use, assures big-payload performance. See your Johnson distributor. Types, sizes, ⅜ to 3 yds.

x 7

(Koehring Subsidiary) **C. S. JOHNSON CO.** CHAMPAIGN, ILLINOIS



"Thrifty citizens . . . with Savings Bonds . . . less likely to be taken in by the false promises and ideologies of communist propagandists . . ."

LUCIUS D. CLAY
Chairman of the Board
Continental Can Company

"The regular purchase of Savings Bonds through the Payroll Savings Plan by millions of our citizens contributes importantly to the country's economic stability, the national defense effort, and to the financial independence of the individual. The thrifty, self-reliant citizen is one far less likely to be taken in by the false promises and ideologies which communist propagandists invariably direct to the 'have nots'."

• To thousands of company executives, accountants, payroll department employees, PSP means Payroll Savings Plan, the simple payroll allotment operation through which employees make a monthly investment in U. S. Savings Bonds.

• To almost eight million employees of nearly 50,000 companies, PSP has a more intimate connotation. To them, PSP spells *Personal Security Plan.*

• Multiply the personal security of a single Payroll Saver by 43,000,000—the number of individuals who hold Savings Bonds having a cash value of $49.5 billion—and you have economic stability that is the keystone of our national defense.

• Thanks to the thousands of companies which offer their employees the Payroll Savings Plan, Bill Brown in the Machine Shop . . . Joe Green in the boiler room . . . and eight million more Browns and Greens can well turn a deaf ear to ". . . the false promises and ideologies . . ." of communist propagandists. Bill can see his new home taking shape in his growing stack of Savings Bonds . . . Joe sees each bond another step toward a college education for little Joe . . . and the "Old Timer," who eats his lunch with Bill, talks of "sitting down pretty soon" because his Bonds will make a nice addition to his Social Security.

• PSP holds still another benefit—this one for the employer. Payroll Savers are conscientious workers. Statistics show that absenteeism goes down, production improves and accidents decrease as payroll participation goes up.

• If employee participation in *your* Payroll Savings Plan is less than 50%—or if your company does not have a Payroll Savings Plan—get in touch with Savings Bond Division, U. S. Treasury Department, Washington Building, Washington, D. C. Learn how easy it is to help your country, your employees and your *company*—through the PSP.

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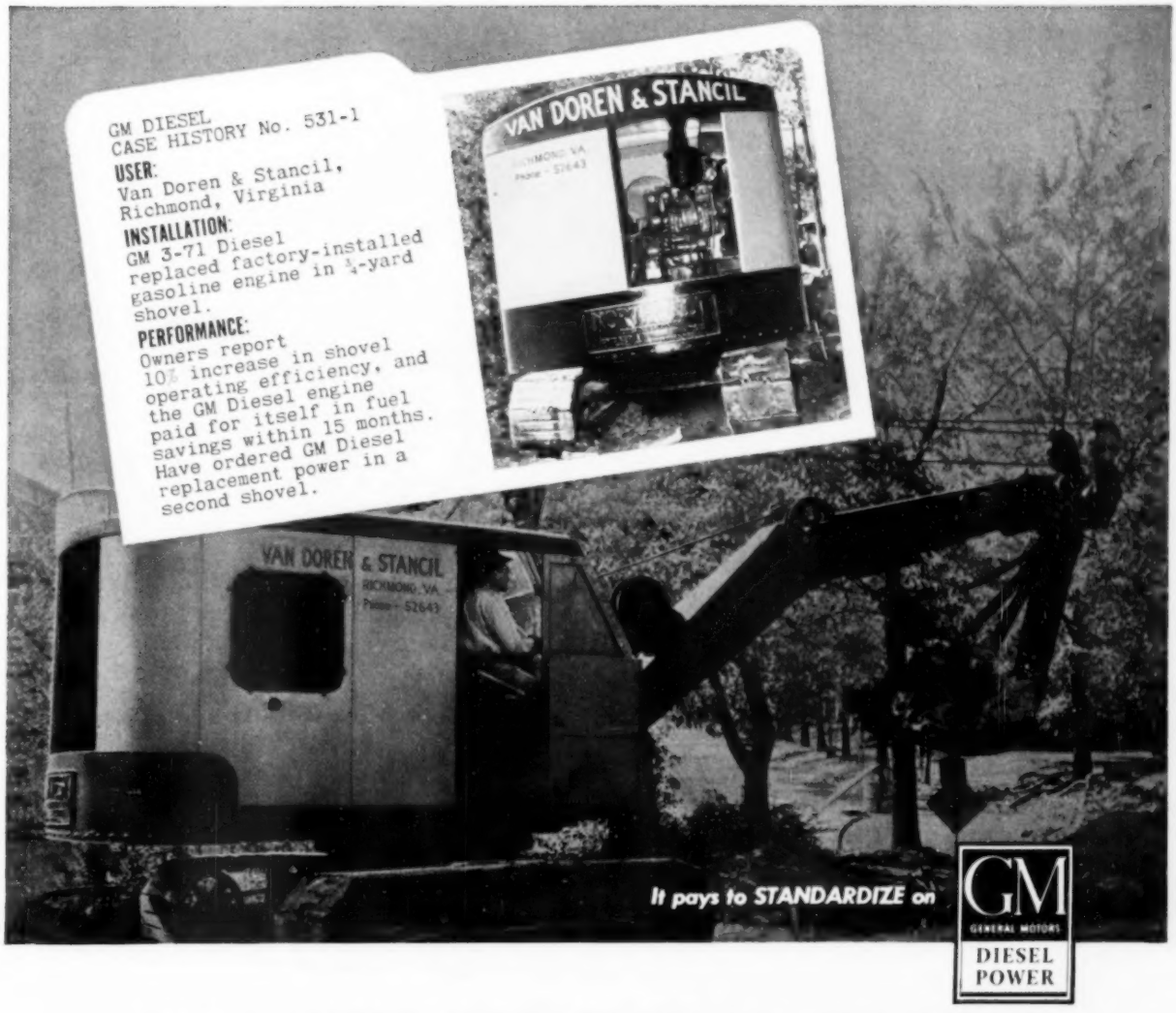
Excavating Engineer



PAID FOR ITSELF IN 15 MONTHS IN FUEL SAVINGS ALONE

This Virginia contractor reports that the shovel had been using 5 to 5½ gallons of gasoline per hour, at a cost of 21 cents a gallon. With the installation of the General Motors Diesel, however, the shovel used a maximum of 2 gallons of Diesel fuel per hour, at a cost of 13.2 cents a gallon. These results were even better than the dealer quoted. But they're typical of the economy you can expect when you switch from gasoline to GM Diesel power. These rugged *2-cycle* Diesels fit in the same space as industrial gasoline engines of comparable horsepower. They are easy to start, cost little to operate and maintain, and deliver a smooth, responsive flow of power that gets work done faster. Ask your nearest GM Diesel distributor to show you how this low-cost Diesel can pay for itself in your equipment.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.

Dozens of Uses • Thousands of Users

Prove Ability, Versatility of the Model D

40 Brake hp. • 8,800 lb. (bare)
Four speeds forward to 25.6 mph., reverse to 3.3 mph.

The thousands of satisfied owners are still finding new uses for the able and versatile Allis-Chalmers Model D Grader. It has proved again and again that it has the power and capacity to do outstanding work on both construction and maintenance.

Usefulness of the Model D is multiplied by several easily mounted attachments: hydraulically controlled rear-end loader, shoulder maintainer that is interchangeable with the loader, scarifier, both V-type and blade snowplows.

MORE POWER, NEW FEATURES, LOW COST

For even greater performance ability, power for the Model D has been boosted to 40 brake hp. Also, leaning front wheels and power circle turn now are available (optional). With these and other big-grader features such as tandem drive, ROLL-AWAY Moldboard, tubular frame and hydraulic blade lift — the Model D's original cost still is but one-third that of a large grader. Operating costs are low, too.

Your Allis-Chalmers dealer will be glad to demonstrate what the versatile, economical Model D can do for you.

ROLL-AWAY is an Allis-Chalmers trademark.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

...for contractors

Finish grades between forms on road and street construction.

Levels for home building, parking lots, play areas, etc.

Terraces, builds diversion ditches, does miscellaneous grader work.

Loads sand, gravel, dirt, any material, with ⅝-yd. bucket.

Rough grades, spreads and cleans up on street or road construction.

Landscapes, grades lawns, slopes, ditches around housing projects.

...for county and state highway departments

Scarifies with plenty of down pressure, accurate hydraulic control.

Mixes thoroughly, with rolling action of ROLL-AWAY moldboard.

Cuts and cleans ditches, slopes banks, grades shoulders.

Reshapes and maintains shoulders with rear-mounted attachment.

Loads sand, dirt, snow—any material — to trucks.

Keeps roads in shape the year-round — clears snow in winter.

...for cities towns and townships

Maintains streets and alleys, park drives, playgrounds.

Handles light construction on streets, roadways, etc.

Backfills ditches, packs and levels ground, loads excess dirt to trucks.

Removes weeds from street sides and alleys, loads or hauls away.

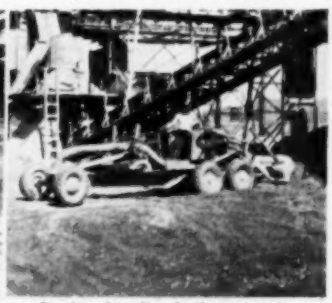
Windrows snow with blade, or plows with V or blade plow.

Loads snow from gutters, maintains stockpiles, handles bulk materials.

...and others

Builds and maintains access roads for quarries, cemeteries, etc.

Clears and loads snow at quarries, storage yards, parking areas.



Grades, handles bulk materials around industrial plants.

Another Example of Efficient Power at Lower Cost

By far the largest dragline in Alabama . . . a new 1,285,000-pound Bucyrus-Erie unit, powered by a modern 850-hp Cooper-Bessemer diesel. Owned and operated by the DeBardeleben Coal Corp., the unit strips overburden and is a key factor in increasing this company's coal production 10,000 tons a month while reducing mining costs.

How a big "DRAG" minimizes power costs

By far the largest dragline ever used in Alabama, the new "H. T. DeBardeleben" (shown here), is now stripping rock, sand and shale at a rate of 600 cubic yards an hour in double truckload bites. And like so many big draglines everywhere, it has the money-saving advantage of a husky, smooth-running, long-lived Cooper-Bessemer.

But check up on *all* the factors that determine the efficiency, behavior and cost of power. You'll come up with the reasons why Cooper-Bessemers are favored engines in this and all other kinds of heavy-duty service.

There's a Cooper-Bessemer diesel, gas engine or gas-diesel for every power need from 200 to 3700 bhp. Our nearest office will gladly give you specific information.

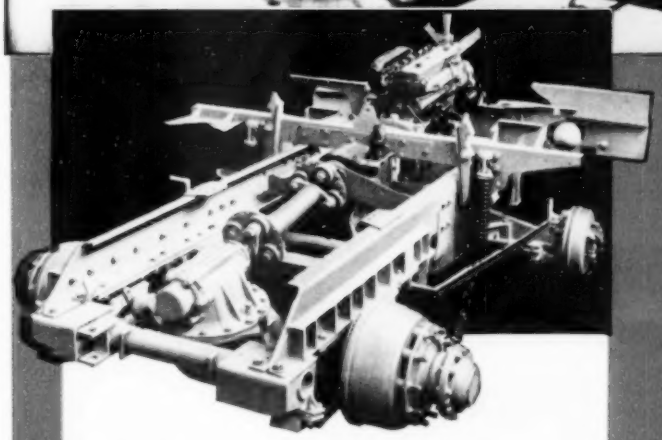
MOUNT VERNON, OHIO

COOPER-BESSEMER

GROVE CITY, PENNA.

New York Washington, D.C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Shreveport St Louis Los Angeles Chicago Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Tulsa Gloucester, Mass. New Orleans, La.

Strength with FLEXIBILITY



ENGINEERED for DURABILITY

This is a chassis built to stand up to the worst conditions which construction work can offer and will save dollars on maintenance and repair, just as the instantaneous gravity tip action saves time on the job.

MASSIVE DESIGN
RUGGED CONSTRUCTION

EQUALLY AT HOME ON ROAD OR SITE

There is no Dumper in the world like this British-built Muir-Hill 4½ yarder. Over twenty years know how is built into this—the most advanced unit in its field. Just off the press is a new Muir-Hill publication giving the whole story. Write us today for a free copy.

MADE IN ENGLAND

The Muir-Hill 14B MODEL 4½ CU. YD. DUMPER

E. BOYDELL & CO. LTD., OLD TRAFFORD, MANCHESTER 16

Cables: 'Muirhil' Manchester 16, England

THE WORLD'S BIGGEST DUMPER BUILDERS

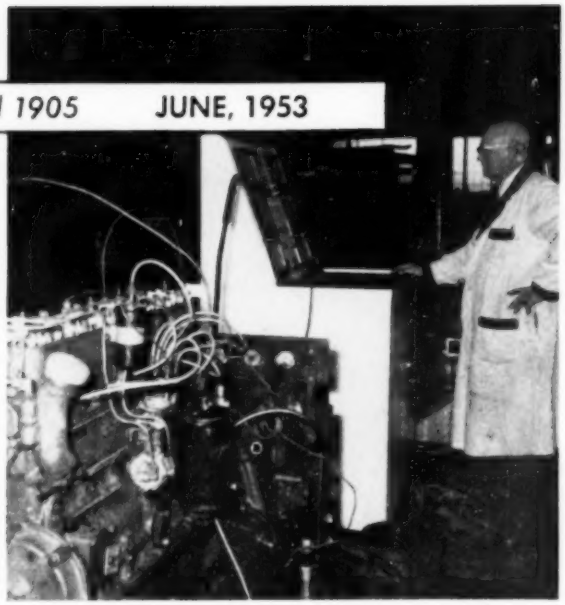
dm EB 194

Excavating Engineer

founded 1905 **JUNE, 1953**

He Makes Equipment Look Younger Live Longer

Meet Norman M. Jones, head of an Evanston, Ill., contractor's mechanical division. He's spent 35 years developing the program which keeps firm's construction equipment in top shape.



• Norman M. Jones, chief engineer of Arcole Midwest Corporation's mechanical division, watches Clayton dynamometer.

"VERY soon the difference between the successful contractor and the unsuccessful one will depend on his preventive maintenance program. Bidding will get much tighter in the months ahead. As a consequence, a really effective PM system will be needed to give the high production which will spell profit instead of loss."

The speaker was Norman M. Jones, a man who eats, sleeps and breathes maintenance. Officially, Jones is chief engineer of the mechanical division for Arcole Midwest Corporation. It is a good-sized contracting firm with headquarters at Evanston, Ill., in the north-of-Chicago area known as Skokie Valley.

In his position, Jones is responsible for the working order of some 800 to 900 pieces of major construction machinery. Certainly it is a big job even by construction industry standards.

The last week of February this year, when *Excavating Engineer* visited Arcole Midwest Corporation, was a week for talking maintenance. These five working days were devoted to the most spectacular part of Jones' program. The second annual Educational Meetings Week was taking place in Arcole's engine overhaul room, cleaned out especially for the event.

Jones joined Arcole in May 1951. He held the first week of meetings in January of 1952. (Light winter construction schedules determine the best time for the get-together.) That both the meetings and Jones' practices have proved successful from a management point of view may be deduced by Arcole's willingness to buy the man-hours for a second week of talk. We don't know exactly how many men

• Below left: With aid of movies, charts and parts, Allis-Chalmers representative explains crawler maintenance to Arcole Midwest mechanics in engine overhaul room. Below right: Blacksmith shop plays leading role in program for heavy equipment.

• Above left: Master controls list each part on each Arcole machine. Control guides parts purchase, reveals weak parts. Above right: New dump body awaits truck on company's outdoor hoist located behind shop. Most trucks are Internationals.

attended the classes nor their hourly rates (substantial in the construction trades), but multiplied together they represent a fair-sized piece of change. It is a real tribute to Jones' ability.

Each employee concerned receives a mimeographed program for the week. By reading his sheet, he will know what subject is under discussion during any of the 40 working hours that week. He will learn also who is to conduct the talk and who, on the Arcole roster, should be in attendance.

Speakers come from three sources. Manufacturers of equipment used by the company send men; Chicago distributors of the equipment send representatives; and the Arcole staff takes over much of the job. Arcole furnishes the meeting place with all the accessories of a classroom—chairs, blackboard, desk, screens, and projectors.

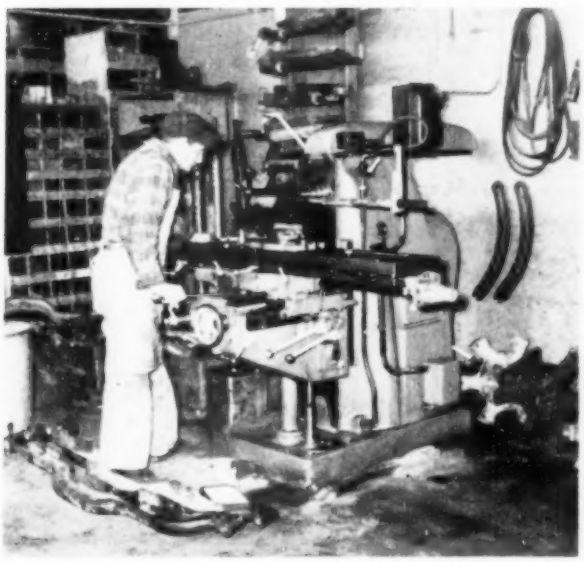
Full Course Offered

Sitting in on the sessions, you can become well acquainted with almost all major types of machines in construction use today. Trucks, excavators, tractors, pumps, generators, compressors, vibrators, air tools, pavers, scrapers, road graders — these are typical of the tools discussed.

The two makes of crawler tractor found in Arcole's fleet were ably presented by representatives of Allis-Chalmers Manufacturing Co. and Caterpillar Tractor Co. Men from their distributors were there to help, too.

A factory representative flew in from Detroit to give a talk on the maintenance of Gar Wood scrapers. Bucyrus-Erie excavators were well presented by men from the factory and the Chicago distributor. Because Arcole operates an exceptionally large fleet of Interna-

• Below left: Cincinnati milling machine is one of many power tools available to the maintenance crew at Arcole. Below right: Here is one of the sheets periodically handed to operators. It gives a user's view of the equipment. Sheets cover each type.



OPERATORS' REPORT

AUTO PATROL

Equipment No._____

Operator's Name_____

Date_____

Please give us your idea of the operating conditions of the following units on the Auto Patrol you have been operating.

Diesel Engine -

How is the power?
How is exhaust? Clear?_____Blueblack haze?_____black smoke?____
What is oil pressure when operating?_____
What is fuel pressure when operating?_____
How much oil do you add each day?_____
Any unusual noises in the engine?_____
Is it hard to start?_____
Any water leaks?_____

Starting Engine -

Is it hard to start?_____
How is the starting clutch operating?_____
Any water leaks?_____
Any gasoline line leaks?_____
Is the transmission or gears noisy?_____

Master Clutch -

Is it operating properly?_____
Does it have to be adjusted very often?_____

Transmission -

Any trouble here? If so please describe -

• Manufacturers and distributors were helpful. One Chicago distributor, D. D. Kennedy Co., sent over a catered lunch.

tional gasoline-powered trucks, the greater part of two days was allotted to International Harvester Company experts. This group explained the recommended care and feeding of their product from bumper to tail light.

In their talk, the manufacturers' men gave a complete run-down of the best maintenance practice for their machines. Movies, slide films, cutaway parts, and give-away booklets helped drive home important points. All speakers encouraged the mechanics and operators who were listening to interrupt with questions. After each presentation, a period for questions followed.

Arcole personnel spoke on equipment whenever factory representatives were unavailable. Safety, an often-overlooked but important part of preventive maintenance, was given thorough treatment by an engineer from the contractor's insurer, Fidelity & Casualty Insurance Co. An Ethyl Corporation of America engineer came equipped with a one-cylinder engine which he put through its paces. Two instruments attached to the engine—a tachometer and a combustion chamber heat gauge were projected on the screen as the engine ran. The speaker vividly demonstrated a number of gasoline-engine maintenance principles with this set-up. He raised the compression ratio of the engine as it ran, a result sometimes obtained by the forming of carbon deposits in the cylinder head. An engine knock resulted with loss of power. Increasing the valve lash over factory specification brought on a drop in rpm. He deplored haphazard methods of adjustment. "The day of the thin dime, sensitive ear, and screwdriver is gone," he said. Among the maintenance pointers the Ethyl representative brought up was the importance of accurate breaker point setting. He recommended the use of a cam angle meter instead of feeler gauge for setting and showed how poorly-set points steal power and run the engine hot.

• Here Jones displays one of the cabinets which house special tools, some home-designed for easing tough jobs.

35 Years' Experience

One of the more competent speakers on the week's program was Jones himself. With 35 years in the field behind him, he is able to give a finished off-the-cuff talk on almost any branch of maintenance. This was demonstrated during the Allis-Chalmers period when the factory envoys showed their brand-new movie, "The Big Job," taken at Garrison Dam, world's largest rolled-fill embankment.

After the film, Jones talked on haul road condition at the dam project. Smooth, hard haul roads can go a long way towards cutting truck repair cost, he said.

To emphasize the point, he recalled his own earlier visit to the construction site. "In fact it was possible to drive

over those haul roads at very high speeds in a passenger-type automobile," he said. "They were as smooth as a highway."

Jones explained that "they don't drive like that at the dam all the time. In fact, the only time a passenger car or pick-up is allowed on the roads is during the non-production hours. If other traffic were permitted on the haul roads during production hours, the Euclid traffic would be slowed down with a loss in output. Even the superintendent uses rural highways to get from one place on the job to another."

Lunch Provided

To round out the week, one of the local distributors, D. D. Kennedy Co., provided a buffet luncheon for the shop. All in all, the second annual Educational Meetings Week at Arcole Midwest Corporation was a success.

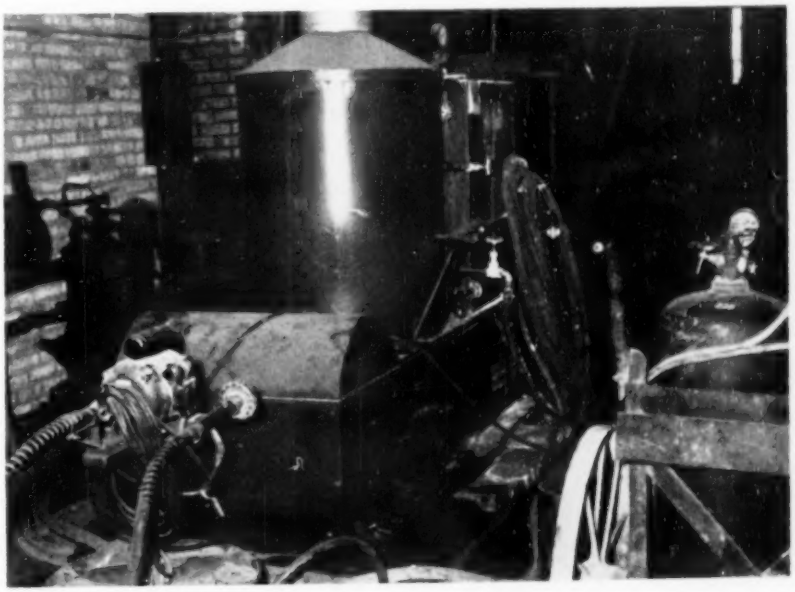
Although the five-day session for mechanics, operators, and foremen is a newsworthy way of dealing with maintenance, it is only a small part of the Arcole program. You might call the lecture period the high point of a fully-developed year-round system. It helps assure success for the practices which shop men are asked to follow; it sharpens the operator by showing him how shoddy operation builds up repair bills; it develops a team spirit which makes the individual perform better.

In the two years that Norman Jones has worked for Arcole Midwest Corporation, he has brought into being a maintenance system which gives every piece of equipment "a mother's care." Not even a wheelbarrow is considered too lowly for the program.

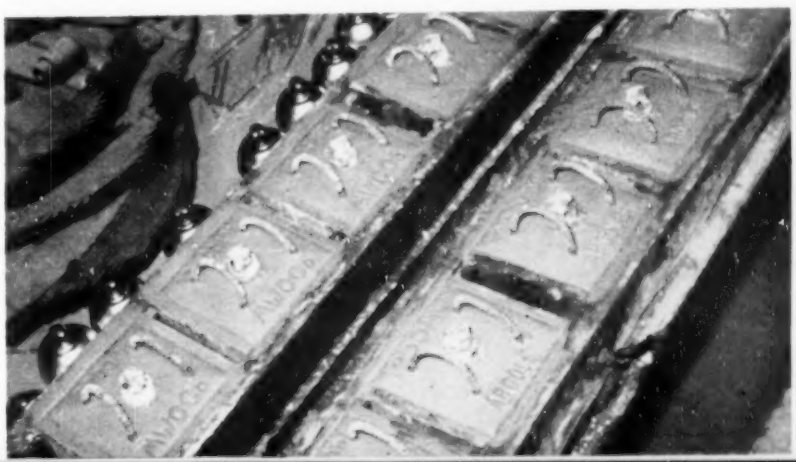
To begin with, the organization was split into three sections. The *automotive* section deals with trucks and pick-ups. The *miscellaneous equipment* section has under its jurisdiction such items as pavers, vibrators, compressors, pumps, and the previously-mentioned wheelbarrows. Finally, a *heavy-duty* section is responsible for the readiness of all earthmoving machines, shovels, scrapers, tractors, and self-powered scrapers.

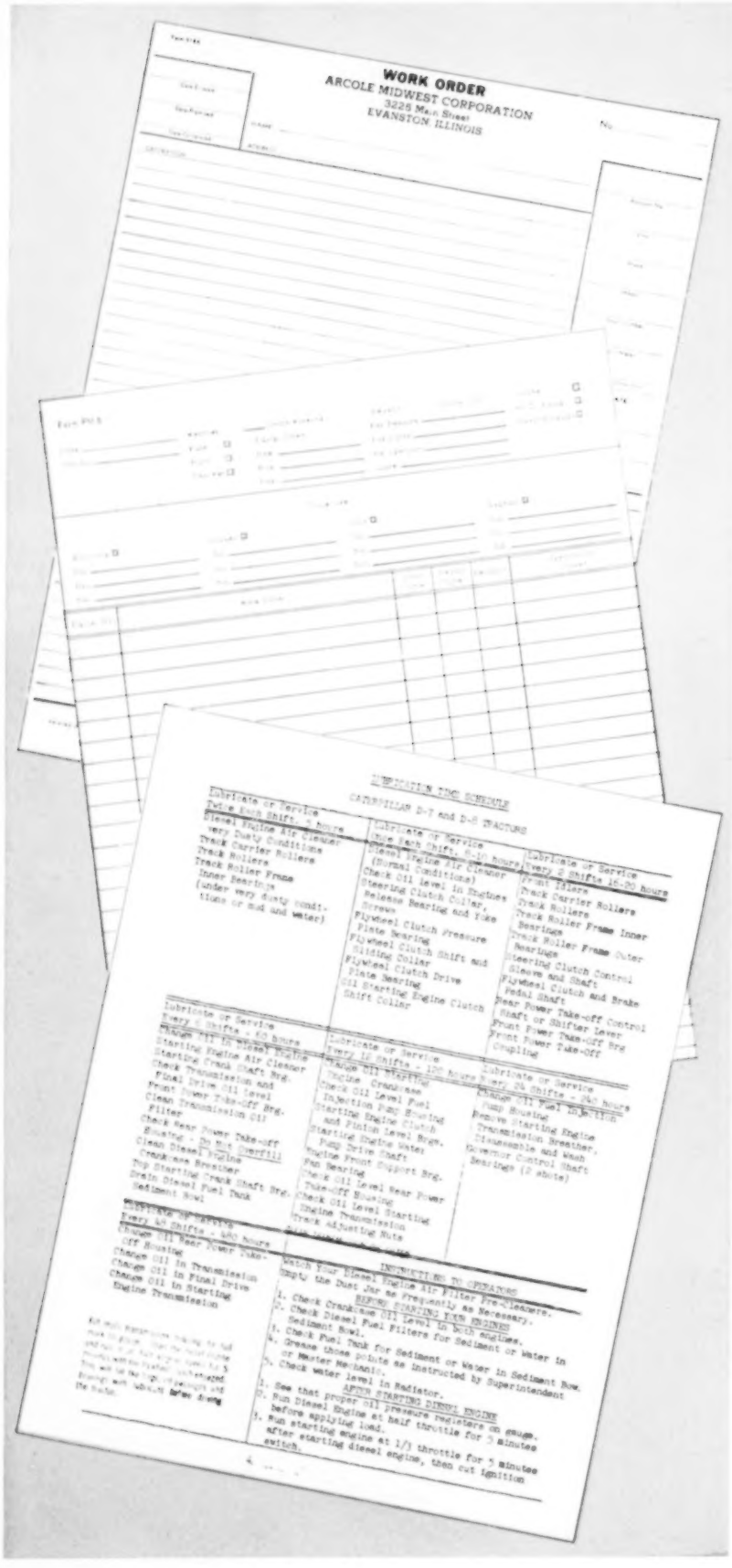
The shop itself was separated into three areas with one section assigned to each. Facing a bank of large windows along the east wall is the automotive section. Here a row of trucks can be spotted so that natural light plays on the engines. A shop-long bench lines the wall and ends at the engine overhaul room. Overhead, elec-

• From the spreader up, shop men are re-building a paver. Here Jones confers with his master mechanic in the miscellaneous equipment section which maintains such machines as vibrators, compressors, pumps, pavers, wheelbarrows (they're covered, too).



• Above: A Malsbary Model 352 oil-fired steam cleaner is a helpful shop tool when it comes to repairing and painting equipment. Below: Here's how the Arcole crew maintains oil torches. They are encased in concrete, given handles and initialed.





tric cranes make it easy to lift off accessories and engines.

A battery storage space in the automotive section keeps 100 or more new and used batteries available. One Blitz and one Allen battery charger keep the storage cells ready for action. In one corner, a Bishman tube dunker helps the crew on blowout fixing.

Strip Accessories

When a piece of equipment comes in from the field to get the works, mechanics remove accessories first. In this step, such parts as radiator, water pump, spray nozzles, starter, and generator are taken off. The crew reconditions the part or, if it is past reclaiming, takes a new one from stock—if it is an item carried in the ample stock storage. Often a new part must be ordered from distributors because the faulty piece is not one of the most-frequently needed parts, which are the kind Jones stocks. Accessory reconditioning and ordering is handled so that all parts taken off come back ready for installation when crews finish overhauling the engine and are ready to put the truck back together.

The Arcole mechanics do their own overhaul of starters, generators, and spray nozzles. They lift out engines, all gasoline in the Arcole fleet which has been designed for short-haul work. These are majored in a special brick-enclosed room which keeps foreign particles out of the engine innards.

When the engine is re-assembled, it is run in on a Clayton 500 hp dynamometer. Large engines go across one end of the tester and small engines go across the other end. Valve settings are completed on the dynamometer with the cam angle meter.

Jones regards the dynamometer as a necessary tool in the preventive maintenance program. He points out, "If you don't put an engine on the dyno, and you score a cylinder wall in the first couple of days of work, you have shot the price of the job."

The men in the shop give considerable attention to the body of the truck, too. As a starter, it gets a thorough steam cleaning. Rough spots are sanded and ground and dents pounded out. It is painted Arcole's orange and the company name is stenciled on the cab. A well-equipped spray booth handles all paint work.

In charge of the automotive section

• Top to bottom are some of forms. Shop Work Order, Downtime Job Record, and plastic-covered sheet for cylinder.

• Arcole Midwest Corporation's yard is arranged like a well-ordered shop. The tools, mostly earthmoving, are large but there is a place for everything and everything in its place. One of first steps under Jones' program was planning the yard for efficiency.

is Master Mechanic M. N. Rasmussen. He also serves as truck dispatcher. In the fleet he maintains are 79 rear-dumps, 10 flat beds, two grease trucks, 20 pick-ups, four specials (welder-mounted and concrete form trucks), nine tractors for pulling semi-trailers, and two winch trucks. Almost all are Internationals.

The miscellaneous equipment section holds forth in the center section of the shop. Here machines which come under the miscellaneous classification — anything from asphalt and concrete pavers to hand vibrators and torches—are repaired and periodically overhauled. When *Excavating Engineer* visited the shop, the biggest job under way was the re-building of a paver from the ground up.

A small but adequate machine shop occupies a portion of the miscellaneous equipment area. Here the crew may use such tools as a Cincinnati milling machine, a Molitor lathe, a valve face grinding machine, an English and Miller drill press or a small Mid-States welder (there is a larger welder in the heavy-duty section). When necessary, the men build simple parts if they can't be purchased. However, Jones likes to avoid making parts since they cost so dearly.

No piece of equipment is too small to escape attention. In the miscellaneous section, workmen were casting a new shipment of ball-pot kerosene torches into compact concrete blocks. Before the concrete set, the company's initials were inscribed in the block. Setting the torches in concrete makes them last longer, keeps them from being tipped. The initials, of course, help discourage theft. This group also keeps a fleet of wheelbarrows in first-class working condition. They are pounded out, repainted, and re-tired when their condition calls for it.

Peter Conrad, Sr., is the master mechanic in charge of the miscellaneous equipment section. During our visit he had just finished examining a large paver from boom to tracks. The parts required to put the machine in tip-top shape were listed. Next, the list would be submitted to the Chicago distributor for a complete price. On the basis of parts cost, labor cost, expected life of paver and cost of new paver, Jones and company executives would decide whether the old machine should be repaired or traded in.

The third maintenance crew — the heavy-duty section — takes over the shop's western sector. Repair of crawlers, cranes, and other earthmoving machines is the job of mechanics assigned to this group. They were in the act of reconditioning a big crane and had just put rebuilt tracks on a crawler tractor to finish a complete overhaul when this reporter went through the shop.

Top-to-bottom reconditioning is the rule here, too. Engines, hoist drums, cabs, booms—all parts come off when

• Each piece of major equipment, like this tractor, is outfitted with a metal cylinder and cap. Maintenance recommendations and servicing record go into it. Division master mechanics can thus spot check at any time to see how field men treat machine.

the machine is dismantled. All are rebuilt or replaced. Cabs and cowling are straightened out and painted. An old crane in the yard looked brand-new after its tour through the heavy-duty section.

At one corner of the section near the spray booth, a Malsbary oil-fired Model 352 steam cleaner was available for cleaning grease and muck off parts. Another room leading off the heavy-duty section encloses a well-equipped blacksmith and welding shop under the direction of John Bornhorst, Sr. Jones regards a shop of this kind indispensable in the maintenance of earthmoving equipment. In addition to shop welding, two company trucks mount welders for repair in the field.

Master Mechanic Leo Bree heads up the heavy-duty section. Bree's inventiveness has paid off many times in the design of tools and methods for more efficient repair of heavy machines. During our visit, he made a lead-bottomed sleeve which eased the job of inserting crawler track pins. Commenting, Jones said, "He's always coming up with ideas like that."

The fleet maintained by the heavy-duty section includes 10 crawler cranes (also equipped for dragline service), 10 scrapers, six LeTourneau Tournapulls, 10 highway patrols, and 30 crawler tractors. Twenty of the crawler tractors are equipped as pushers and dozers.

• Master Mechanic Leo Bree, head of heavy-duty section, demonstrates a lead-bottomed sleeve he devised for putting track pins back in place on crawler tractor. Jones knows worth of inventive men like Bree "who are always coming up with ideas."

Master Parts Control

A separate room adjoining the shop houses an ample parts storage. In stock are carried all items which are most likely to give trouble—critical items, Jones calls them. Parts requisitions which the crew keeps are transferred to two master control files which contain a card for every part on every piece of equipment. By looking it up in the files, you can determine exactly how many of any specific part were used during any period of time. If a lot of a particular part has been used, it is stocked. If too many of a part are used, further investigation is called for. In several instances, when a part needed replacement too often, Jones' men analyzed the part and discovered defective manufacture. Getting together with factory men, they have made improvements. Thus both the manufacturer and Arcole have benefited — Arcole by cutting maintenance costs and the manufacturer by putting out a better product. On occasion, the Arcole procedure has been able to spot a defective part for a manufacturer before the machine was widely used in the field. In those instances, the manufacturer has been grateful for the information which prevented new customers from being disgruntled.

Parts storage also houses parts which the crew has reconditioned. As an example, several complete truck engines are kept on skids there. These have been completely overhauled and sealed, navy-style, against moisture.

Sharp-eyed inspection is one of the main features of Jones' program at Arcole Midwest Corporation. "We do all we can to try to catch potential downtime before it becomes major downtime," he says.

Job Master mechanics in the field, of course, inspect equipment every day. A double check on their inspection is the periodical spot check of the sectional master mechanics who keep in touch with machines in the field. In season, this involves quite a lot of traveling. Arcole frequently has 10 jobs going within a radius of 20 miles, plus jobs in other states. But the constant inspection has paid off many times. Often a machine may be pulled in and re-fitted with parts showing wear or impending failure while another machine can replace it. Thus a minor inconvenience now prevents a later catastrophe when all machines are busy.

The yard which stretches out for a half mile behind the Arcole shop and offices shows the guiding hand of Norman Jones, too. Like a well-ordered shop, there is "a place for everything and everything in its place."

Shape-Up Yard

Soon after taking over his job, Jones drew up plans for re-spotting equipment in the yard. This plan, which took the form of a blueprint, now hangs in the parts storage. By referring to it, you can immediately tell the station of all types of equipment out in the yard. The design was aimed at increased efficiency. Cranes are spotted near the bucket and boom storage facilities. Concrete form storage lies at the end of the cleaning and straightening rooms. At Arcole, workmen clean forms with acid, steam and water and re-shape them before stacking.

Binding together the many program elements is a system of paperwork controls. A few of the forms Jones uses he adopted but the rest he developed himself. The records tell him how much maintenance costs, how it is cut-

ting downtime, and where to concentrate future efforts if downtime is to be reduced still more.

The aim of shop records is to keep close tabs on repair costs. A work order is taken out on every piece of machinery which goes through the shop. The machine's number is listed on the order. (Nearly 900 pieces of equipment receive numbers.) As the repairs are made, requisition for parts drawn are attached to the order. The mechanics who handle the job punch in and out on cards which accompany the work order. Thus by adding the two factors —parts and time—the cost of the repair is established.

Mechanics in the field keep downtime records. One of these reports is turned in at the end of each day's activities. It covers all equipment and its completeness presents an accurate picture of downtime quantity and cause. The sheet lists such considerations as weather, how much time was spent waiting for parts, was the machine a spare, did the lack of an operator hold it up. On the record, downtime is recorded in quarter hours. Breaking it down gives the time extra significance.

Often repairs are made in the field. Critical parts may be ordered by requisitions which are turned in with the downtime record. The office can thus fix the monthly downtime cost by adding the three factors—downtime, cost of parts as shown on requisitions, and labor costs. Periodically, Jones writes a memo to the front office analyzing the complete downtime each month. These reports will often show as many as 15 causes with a percentage of total downtime behind each.

● After overhaul in the Arcole automotive section, truck gasoline engines are stored "navy style." Ports and openings are sealed off. Engines are run-in on dynamometer before overhaul is complete. Valve settings are made on dyno cam angle meter.

Two-part tags are affixed to all power equipment overhauled or repaired. When the equipment goes into the field, half the tag is torn off and sent to the office. This serves notice that the machine is no longer available in the shop and tells when it went to work. Another type of tag is attached to equipment coming into the shop or to sub-assemblies from a major overhaul job which must be checked or rebuilt. This tag gives a description of the work needed.

Major equipment such as cranes, tractors, pavers, and compressors has a metal cylinder with metal cap attached to it with strap iron. In the cylinder goes a plastic-covered sheet of factory or Arcole maintenance recommendations for that particular piece of machinery. (Arcole's recommendations are often more strict than the factory's.) Also in the cylinder is a maintenance record for the type of machinery. Each servicing of the equipment must be recorded. Thus, the master mechanic can stop any machine wherever it is and spot check the job his maintenance men are doing.

● One of Arcole's Northwest clamshells works on an aggregate stockpile. This picture, like the one on the next page, illustrates the pay-off: Machines ready to go at any time. Ultimate goal is to have no piece of equipment down when there is work for it.

Issue Master Books

A durable book of the loose-leaf type is given to all mechanics. In it are the maintenance requirements for all the machines which they will care for. The books miss no detail. In addition to these master books, a super master book is kept in the shop. It covers all equipment.

Jones helps put across his doctrine of preventive maintenance by contributing to the mechanics' master books pages which he thinks will help popularize his favorite subject. You will find, for example, a page called "The Ten Commandments for Diesel Maintenance."

From time to time, Jones puts questionnaires in the hands of the oper-

ators. These ask the operator to evaluate the machine he is running. Such questions as "Is the starting engine hard to start?" or "How is the power?" give him a consumer-analysis of the equipment. Serious complaints merit the attention of mechanics. Sometimes the operator himself will be doing a faulty job and he may be shown better practice.

The man behind this leave-no-stone-unturned maintenance program is thoroughly qualified. Norman M. Jones possesses an instinct for putting his finger on the cause of diseases of machinery. Here's an example:

When a mechanic was troubleshooting a crane engine recently in Arcole's shop, he noticed a slight discoloration of one of the machine's internal parts. He laid his findings before Jones, saying he thought there must be something wrong with the oil. Jones examined the piece and advised his man to search farther. The discoloration, he ventured, was the result of oil starvation but not poor quality oil. Taking this advice, the mechanic went back to his problem and did, indeed, find a choked oil feed line.

Jones' knack for pinpointing trouble comes from his 35 years' association with important petroleum refiners of our country. In his capacity as lubrication engineer for a number of them he often became "an attorney for the defense." A contractor would complain that the oil was poor, causing his machines to break down or perform under-par. Jones would hurry to the scene and it was his assignment to spot the real cause of trouble, quickly and surely. Otherwise the refiner stood to lose a good customer.

Jones will tell you now, from those years of experience, that you are barking up the wrong tree if you place blame on the quality of your lubricants or fuels. He knows that too much research and care go into their manufacture. In fact, he will cite instances from the past where newly designed engines were put across by the development of better lubricants.

He learned that malfunction comes from other directions — poor maintenance practices. Lubricants will be stored where dirt or water get into them. The wrong lubricant will be used. Parts will be over or under lubricated.

In time, Jones held the hand of so many contractors while he diagnosed their mechanical ailments that he was able to write a successful booklet on the subject of spotting trouble. The pamphlet detailed seven basic patterns of mechanical failure which he had noticed. It went out to the oil company's field men and interested customers. Very shortly the influx of pink slips, customer complaints, dropped from 500 per year to 70 per year.

• One of Arcole's Bucyrus-Erie 38-B's pours concrete for a new overpass in Chicago. Jones summarizes his philosophy of maintenance: "In this climate, working hours and days are at a premium — equipment must be available." His system keeps it available.

Like a good doctor, Jones developed a great respect for the old adage which expresses the merits of an ounce of prevention over a pound of cure. For many prominent western contractors, he set up a complete maintenance program. He knew it would lighten his own burden in the long run. The system he has installed at Arcole embodies his best thoughts on the subject as gleaned from experience.

Wanted to Be Lawyer

Today Jones radiates the same enthusiasm for his work that prompted him to change from pre-legal studies to engineering way back in 1917. He had "gone west" to California in 1913 and enrolled at the University of Southern California with the purpose of becoming a lawyer. During the next four years, he worked part-time in the oil fields—or went to school part-time, he gives you a choice. In 1917 at the dawn of the auto age, he got into the sales end of petroleum. He liked it so well that he switched to engineering at Throop College, now the California Institute of Technology.

On the sales side, Jones spent nine years with the Standard Oil Co. of California. Then came six years with California Petroleum Corp. which later merged with the Texas Co. The next 19 years he was associated with the Macmillan Petroleum Corp. which he left to head up Arcole's mechanical division.

Their fine PM program bears out Arcole Midwest Corporation's reputation for constantly seeking perfection. They are proud of the job they do and at the drop of a suggestion they'll take you out to see their handiwork on a bridge or a section of paving—even if you are not in the market. The powers that buy construction must like the Arcole product, too, for in February, in the middle of a midwest winter, the crews were busy on a number of projects.

They were building several bridges on the Congress Street Parkway which will speed Chicago loop traffic to the western extremities of the city. Another crew was working on moving a railroad right-of-way at O'Hare International Airport on the far west side. At LaSalle, a crew was handling a sand drain and bridge job. Downstate, they were widening and paving a section of Highway 33 between Newton and Highway 1. The company uses two-way car radio on large jobs to maintain contact between field offices and key personnel.

President and chairman of the board at Arcole is N. B. Bederman. Henry J. Boesch is vice president and secretary and E. A. Bederman is vice president. H. R. Kunkle is the company's secretary and treasurer.

Behind the men of Arcole are the machines. And behind the machines is Norman M. Jones. As he puts it, "Our one aim is lowering downtime in the field. In this climate, working hours and days are at a premium — equipment must be available." He'll see that it is, too.

• While trenching operations are underway, Austin-Western grader works sand left at road sides into empty ditch. Cleveland No. 140 trencher cuts ditch five feet deep, 26 inches wide, and 12 feet from centerline.

Trencher Joins Roadbuilding Equipment Family

Unique application of Trencher may provide answer to the Southwest's requirements for low cost, all-weather secondary routes. Credit goes to County Commissioner J. F. Bodine of Colorado City, Tex.

ROAD building took on a new twist in Texas—as many things in the Lone Star state do—when County Commissioner J. F. Bodine, Colorado City, began building them with a standard trencher.

Equally remarkable is the fact that sand and clay, the much cussed factors that cause roads to turn into mud seas during wet weather or camel routes during dry spells, are now assets. They're the raw materials in Commissioner Bodine's newly devised method for low cost, all-weather secondary routes.

The trencher is used to cut through the light topsoil and into the heavy clay subsoil, mixing both thoroughly as they are brought to the surface. Commissioner Bodine says that the mixture is a near perfect dirt road building material, about 50% each of sand and clay that will not blow when dry or turn into mud when wet.

First step in rebuilding a road is the removal of fence posts and rolling up the wire that can be re-used when the project is complete.

Next, Bodine uses two International-powered Austin-Western graders to blade the sand dunes on each side of the road toward the center. Road center must be level and side piles of sand bladed down.

Bodine's Cleveland No. 140 Trencher then cuts a ditch five feet deep, 26 inches wide and 12 feet from the centerline. Discharge is directed toward the center of the road. This places a mixture of sand and clay where the graders can spread it later and also raises the crown of the road 24 to 36 inches.

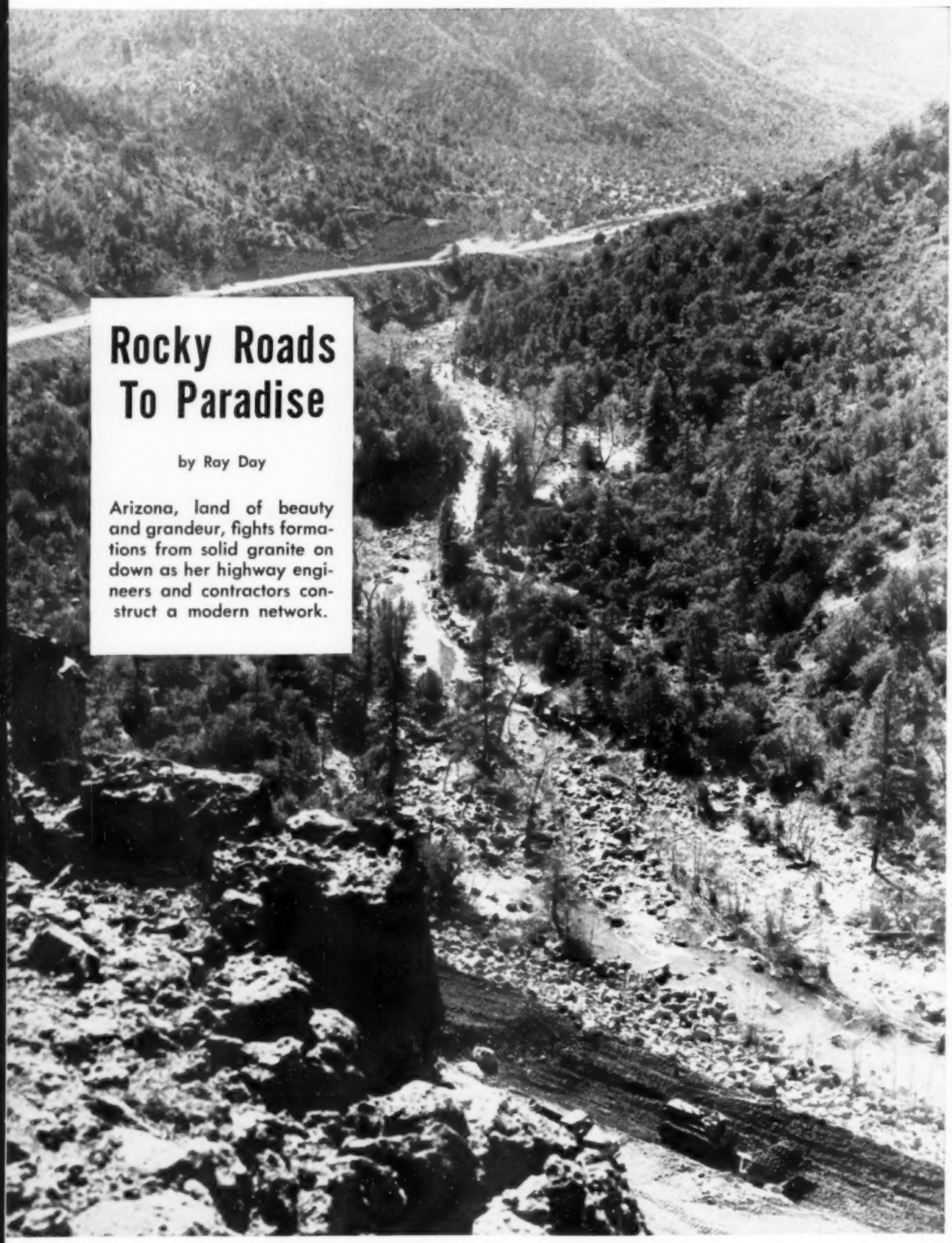
When the trencher reaches the end of a section being worked on, it returns on the opposite side of the centerline, throwing an equal amount of material toward the center. Occasionally, a third or fourth pass is made by the trencher if more height is necessary.

When the trencher has finished its work, the graders work the sand left at the road sides into the empty ditches, packing it by running their wheels over it until the trench is full of well-tamped sand.

Routine spreading of the spoil banks tossed up by the trencher makes an excellent road surface of completely mixed sand and clay. Raised higher than the surrounding land, the road is kept clean by the wind. Also, with sand mixed into the clay, the road dries rapidly after the heaviest rains with water runoff into side ditches.

The Cleveland Trencher travels about ¾ miles in a seven hour day. Powered by a UD-9 Diesel engine from Browning-and-Ferris Machinery Co. of Dallas, it uses about 10 gal. of fuel per day with no oil consumption during 60 hour changes.

• Left: Secondary dirt road in Mitchell County, Tex., before being rebuilt by Bodine method. Right: Same road, rebuilt now, and ready for safe speeds of up to 60 mph.



Rocky Roads To Paradise

by Ray Day

Arizona, land of beauty and grandeur, fights formations from solid granite on down as her highway engineers and contractors construct a modern network.

• Pioneer Constructors have a 5.75-mile section of US 89 near Tucson. Their International TD-24 tractor with Bucyrus-Erie B-250 scraper makes a sharp turn into the borrow area where the team will pick up suitable fill.

ARIZONA, 1953:

From the pine shrouded mountains at Flagstaff to the great saguarro desert near Tucson, Ariz., roadbuilders this year are engaged in a great highway program. The current roster of highway projects released each month by the Phoenix office of the Arizona Highway Department is a big volume. Hardly a corner of the state, and certainly no county, is unrepresented on that list.

For Arizona's engineers are proving that highways must be built in that great state, not only in election years, but in all other times as well, to carry the volume of modern traffic which daily uses some of the most spectacularly beautiful roads in America. To carve these thoroughfares, Arizona's engineers with the help of contractors are gouging through deserts, building raised roadbeds through agricultural country, and blasting highway ledges off the sheer faces of rocky gorges which dot the state from end to end.

There is represented every type of roadbuilding that the West has ever seen. It is all roadbuilding at its best.

In a sense, Arizona is a bridge state, because over her highways travel countless thousands of tourists from all parts of the nation on their way east or west between the two seacoasts of the United States, and intermediate localities. But the state generates its own traffic, too. For Arizona's population, like that of the entire West, is growing rapidly with every passing year.

In an effort to keep pace with such rapidly developing traffic growth, the Arizona Highway Department not only has tried to mend its old highways and build new ones, but it has also pioneered many of the basic improvements of current years regarding highways. The sufficiency rating system, a scheme whereby each mile of road is periodically studied and rated according to various characteristics such as riding surface, safety, appearance, condition of the roadsides and so on, was originated in Arizona.

State Carries on Study

The state is currently rounding out a comprehensive study of the relationship between truck power and climbing characteristics on long mountain grades, and the findings promise to be of vital importance to mountainous states all over the nation. Research of many kinds is being done with a view toward improving the soundness and rideability of every one of the major and minor highways within the state.

But all these activities are overshadowed by the size and scope of Arizona's current construction program, which touches every segment of her economy. To handle the current volume of construction work exceeding $40 million in value, a comprehensive yet simple construction organization has grown up over the years, so the jobs may be done rapidly and properly.

At Phoenix headquarters, the projects are investigated, planned, and opened for construction to the lowest bidder among contractors. Under the chairmanship of C. A. Calhoun of the Arizona State Highway Commission, the Arizona State Highway Department is operating under the engineer-

• Opposite page: It takes plenty of sheepsfoot hours to hold the embankments in places like this. International TD-24 crawler is 400 feet down in cut at Carrizo Creek where US 60 is being realigned.

• Up-looking stance is typical. Page Thiers, left, general superintendent for Fisher Contracting Co., points out rocky problem to assistant, Paul Foster.

ing supervision of R. C. Perkins, state highway engineer. There are four district engineer offices in the state. George Lang, district engineer, holds forth at Flagstaff. J. R. Van Horn is district engineer at Phoenix. R. J. Holland is based at Globe, and F. A. Berg heads the district office in the city of Tucson. C. B. Browning, construction engineer at Phoenix headquarters, directs that program.

From the minimum number of district offices, it can readily be seen that highway construction activities are well centralized within Phoenix. The state depends upon its district engineers, of course, but the district autonomy sometimes found in nearby western states is absent in Arizona.

Arizona's construction designs rate on a par with the best contemporary western practice. The construction program involves not only modern two-lane highways, but roads with a third lane to permit truck climbing space on steep mountain grades, and, in many cases where traffic counts approach current metropolitan ADT figures, the state is building modern divided speedways. Some of these jobs can be seen on Arizona Route 84 between Phoenix and Tucson, and on U.S. 60 and 70 east of Phoenix.

Arizona builds concrete as well as bituminous roads. Concrete has been laid in recent years in the high country around Flagstaff, where soil and subgrade moisture conditions especially favored the use of portland cement concrete. In the desert areas, modern asphaltic concrete highways stand up marvelously even under the action of modern truck traffic. Design criteria are based on an axle load limit of 18,000 pounds, while bridges on main routes are planned generally on H-20 S-16 1944 standards. Generally speaking, the subgrades are constructed by methods designed to develop at least 90% of the density and bearing value of the material. A layer of granular ballast is then placed over the subgrade from ditch line to ditch line, extending completely under both shoulders.

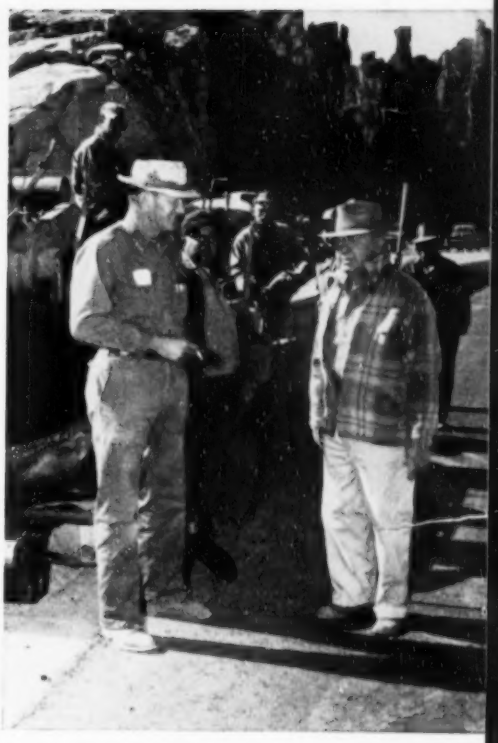
As a matter of fact, on many of the recent jobs, plans have called for plant-mixed pavement from one edge of the embankment to the other. No roads are built in Arizona in trench sections which invite water to gather.

Cushion Traffic Load

The layer of granular ballast is designed to act as a cushion in distributing the traffic loads to the earth subgrade underneath. Over the top of these ballast courses, a select aggregate base course, usually of crushed material resembling very closely the fineness specifications for asphalt mineral filler material, is laid down. Granular compaction is usually delivered by pneumatic rollers, with necessary moisture added during the process to develop good compaction.

Aggregate base courses are usually

• Economics of depression years of 1930's mapped alignments like this twisting section of US 60 where it crosses Salt River Gorge. Elimination of this kind of switchback has been made possible by today's heavy construction equipment.



● Left above: Barber-Greene finisher is working on US 60 in Queen Creek Gorge, near Superior. Right above: Here are more of Arizona's highway builders: Contractor D. A. Flickinger, left, and Resident Engineer Ray Gardner.

sealed with a light asphalt, such as MC-0 or MC-1, and the asphalt concrete surfacing is then laid to finish out the highway. Where moisture conditions seem to require it, even the asphaltic concrete surfaces are sealed with a spray shot of heavy asphalt covered by chips.

In some sections of the state, Arizona engineers have developed an unusually efficient method of building highway sub-bases from volcanic cinders. In some cases, these cinders have even been used as cover material for armor coat.

Arizona has some of the most spectacular excavation in the nation. It has always been tough to carve highways through the rougher mountain country, but the increasing demand for modern highways, even through lofty mountain ranges, has created in recent years many a newsworthy excavation job.

One hundred-foot cuts and fills through solid granite were made in 1947, for example, in the construction of U.S. 80 over Telegraph Pass east of Yuma. Near Pinto Creek, one monstrous fill 202 feet high lay directly under a cut equally high, carved with dynamite out of solid blue granite. The deck of the new Queen Creek Bridge is 150 feet above the stream bed. Sliver cuts in blue granite and dacite at the east end of the new Claypool Tunnel caused Fisher Contracting Co. of Phoenix to mount a wagon drill on a Link Belt Speeder crane, equipped with a 115-ft. boom, and powder shots were placed in holes drilled high against the sheer rock walls by this method.

If a visiting engineer or contractor were sufficiently serious minded to want to see the current Arizona construction program, he could report to Phoenix headquarters, and would doubtless be shown the courtesy of a trip over many of the varied projects. But Arizona's construction people are busy people, and so to save them time, this article will attempt exactly what such a round trip would accomplish.

Mountain Road at Carrizo Creek

In all of Arizona, no mountain highway construction exemplifies rugged roadbuilding better than one currently under way on U.S. 60, between Globe and Showlow, which will replace the steep, winding contortions formerly used up Carrizo Creek Hill. Fisher Contracting Co. of Phoenix picked up the job for $595,900 on their low bid, placed in the summer of 1952. Here is a job which contains 363,500 cubic yards of excavating in only 4.764 miles.

Of this excavation total, 220,000 cubic yards are in malapai and sandstone. The job boasts its share of high fills and deep cuts, too. One 146-ft. cut, consisting of a thin sliver sliced off the Carrizo Creek gorge wall, looks directly down on a 206-ft., 110,000 cubic yard fill.

When Fisher landed this job, none of the other contractors in the state were envious, for what Fisher had agreed to do was one of the most rugged pieces of mountain roadbuilding ever attempted. Fisher had just finished two other jobs up on the mesa flatlands above Carrizo Creek, but they represented nothing as tough as the mountain rock job.

As a result of the studies of truck performance on steep grades, Arizona's highway engineers drew into the Carrizo Creek specifications two widened sections, where climbing trucks can stay over in special right-hand lanes while faster automobiles can roll by as usual. The new location is a far cry from the old alignment, although grades up to 6% have been incorporated into the new location. The highway is fast, with gentle curves and long tangents leading up the scenic gorge.

The surface design, too, meets modern practice. The original design calls for a bituminous mat of the penetration type 34 feet wide, with 10 feet

• Above: GMC dump truck has brought in gravel, and is placing it according to taped distance. Below: Pneumatic rollers work well for compaction of granular base. Huber maintainer pulls Tampo roller.

• Installation of permanent guardrails is step seldom appreciated. Men are using powder, jackhammer, and LeRoi compressor to get posts in solid rock section of US 60 near Queen Creek Bridge.

extra in the climbing lanes. This type of bituminous surfacing was later changed to roadmix, which is possible to lay in the hot summer months with the aid of motor graders. In line with other design practices, there will be three inches of aggregate base course under the bituminous mat, and under that nine inches of select granular material. The latter will carry 3½ miles through the job, while one foot of this material will be placed through the remainder.

The design also includes drainage culverts of Armco corrugated metal pipe up to 153 inches in diameter. Fisher's men assembled these in the field.

Fisher's forces had hardly started before they were right up against a problem general over the country and peculiarly difficult in Arizona: Traffic. Because U.S. 60 is one of the main transcontinental routes passing through this region, it was necessary to accommodate about 60 cars per hour while construction was in progress. That need automatically ruled out the possibility of making the rock cuts with very large blasts.

After considerable study, Fisher's General Superintendent Page Thiers decided to use a road block at each end of the job and, with the aid of pilot cars during certain posted hours, would carry traffic through the construction area at stipulated periods. He was able to accomplish this without losing more than one hour's actual construction work in each nine-hour work day. This was done by opening the road to traffic from 9:30 A.M. to 10 A.M., for another half hour at lunch time, and for another 30 minutes from 2:30 to 3 P.M. After 5 P.M., when the day's work ended, and also during Saturdays and Sundays, the highway was open and traffic proceeded at will.

Large signs posted at both Globe and Showlow, along with cooperative road bulletins from the Arizona State Highway Department and the Automobile Club, succeeded in routing some of the transcontinental traffic over other highways.

Cuts Hard to Start

Running true to form for Arizona mountain roadbuilding, the cuts were practically impossible to pioneer. Most Arizona roadbuilders have been up against many a pioneer problem, and most of them know what it means when conditions get too difficult to move in for the first few feet. For-

tunately, because of the terrain, no pioneer work by hand was necessary, but nevertheless some of Fisher's experiences were incredible.

One Caterpillar tractor, digging into a pioneer cut at the top of a lofty rock race, was out of touch with conventional service equipment for two weeks and two days, as it gradually worked rock loose which drillers and powdermen had broken. The cut was not too wide and the footing underneath was tricky. On this particular cut, a heavy malapai ledge 28 feet thick lay as caprock over the summit of an escarpment. Underneath was a hard, firm sandstone which also had to be removed.

This cut was 146 feet deep, and it looked down on a 206-foot fill containing 110,000 cubic yards. The fill was so deep that in order to build it, the material was shoved off the edge initially, and then handled four times from separate berms, as successive bulldozers moved it toward the bottom of Carrizo Creek where the toe of the fill could start.

Clever Roadbuilding

Clever roadbuilding, typical of mountain highway work by contractors who know what modern construction equipment will do, was exemplified in practically every phase of the Carrizo Creek excavation. For example, U-type dozers mounted on D8's were used extensively to carry material short distances without loss. In the big fill, 30,000 of 110,000 cubic yards were placed direct by this method.

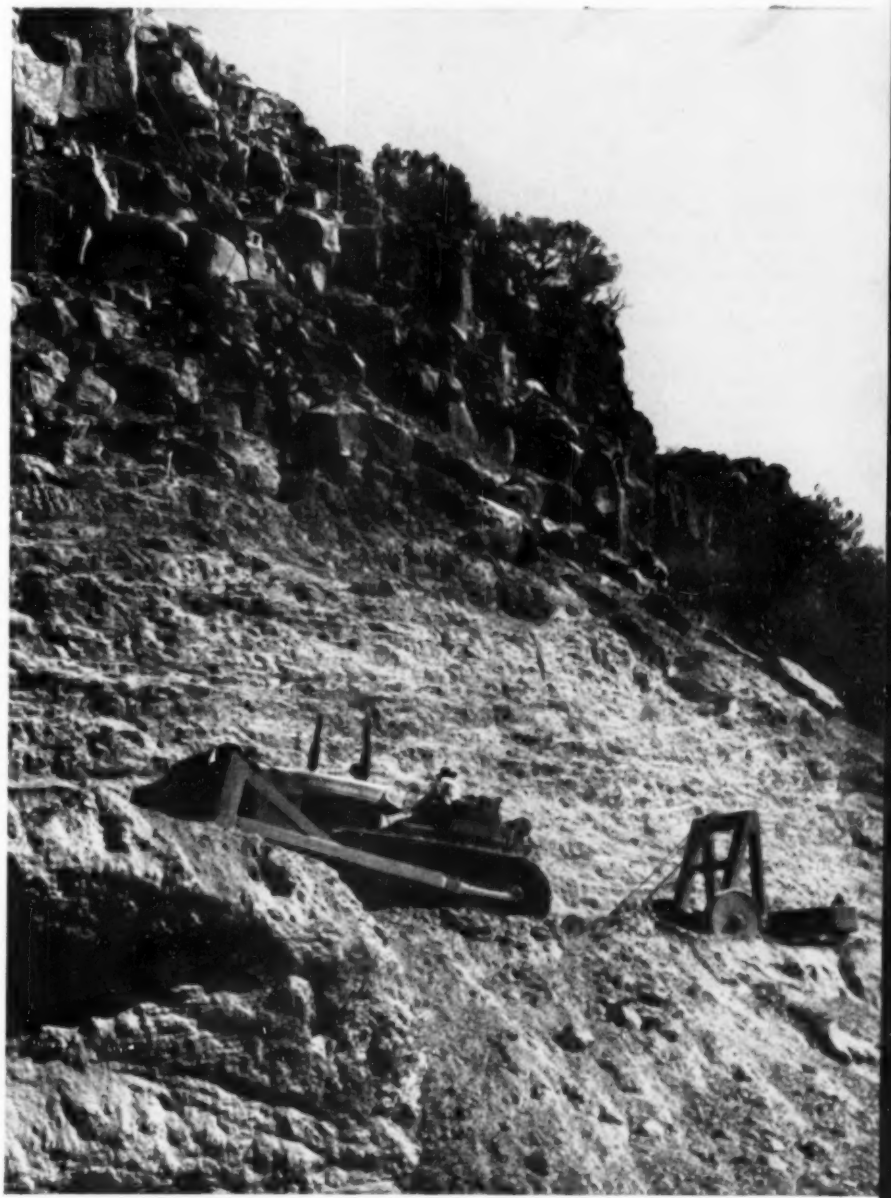
An International TD-24 tractor, pulling a double-tooth Bucyrus-Erie ripper, was used to excellent advantage in a formation formerly considered impregnable to anything but powder. It was this material principally which, after being worked loose, by the ripper, was moved by U-dozers on down to points of placement in the fill.

Drilling, too, was as efficient as modern equipment could make it. In the very thin, inaccessible places, of course, jackhammers had to be used. Where footing was more secure, wagon drills were moved in, and these were used with tungsten carbide bits. In flatter country, however, where the new grade comes up a gentle curve to top out at the brow of the escarpment, a Joy 6-in. rotary machine was brought in. Using Hughes 6-in. bits, this machine reached about 15% of the total drill footage. The 6-in. holes sunk by this machine went as deep as 43 feet, and were spaced on a 15 x 18-ft. grid. Two Joy wagon drills and eight jackhammers equipped with Ingersoll-Rand drill steel up to 40-ft. long rounded out the drill setup.

Compressors were portable, consisting of two 500-cfm Gardner-Denvers, one Joy and one Ingersoll-Rand 105-cfm machine. The rotary holes were loaded with 25-lb. Hercules gelatin-type powder, 40% strength, and these holes were then fired with Primacord detonating fuse. Bigger-diameter loading gave good breakage. The smaller holes, which the wagon drills and jackhammers put down, were bottomed where possible at 2½-in. diameter for the wagon drills, and 1½-in. diameter for the jackhammers. These holes were loaded with Apache 40% bag and gelatin-type powder, equipped with Atlas Rockmaster delays, and the shots were fired by an ordinary blasting machine.

In cuts where rock loading and the transportation of broken material was necessary, two Northwest 80-D shovels equipped with 2½-yd. Esco dippers bailed out the muck. Four 15-yd. bot-

● Ordinary highway cuts become problems for special equipment. The 28-ft. malapai caprock at the top of this cut was underlain by a firm sandstone which required the Bucyrus-Erie ripper drawn by TD-24.



• In its Tucson shop, Pioneer Constructors built this sloping grizzly which screens oversize material loaded out of pit by a Bucyrus-Erie 22-B shovel. An International TD-9 tractor with dozer helped to move this special rig.

tom dump Euclids and five 12-yd. end-dump Euclids were assigned to the two-shovel total to move the blasted material.

Like most of the geology west of the Continental Divide, certain portions of the project were especially applicable for removal by tractor equipment. For these places, Fisher used a 21-yd. Bucyrus-Erie B-170-A scraper, a 27-yd. Bucyrus-Erie B-250, and a 20-yd. LeTourneau Model W. Each of these scrapers was drawn by an International TD-24 tractor, equipped with Bucyrus-Erie power unit. In borrow areas where these machines worked, an International TD-24 and an Allis-Chalmers HD-20 push loaded to assist the operation. Scraper hauls were short, averaging not more than 700 feet one way.

Three 18-yd. Euclid scrapers were also brought in for longer hauls, averaging over 1000 feet. Pulled by Euclid rubber-tired prime movers, they covered hauling especially suited to their particular characteristics.

The fills were placed by end-dump methods in rock, and 4-ft. lifts in combinations of rock and earth. Wherever possible, in accordance with good construction practice, the material was laid in even thinner lifts than specifications allowed. The lifts were smoothed by a Caterpillar D8 and dozer, and compaction was assigned to an International TD-24 with a 19-ton Southwest double sheepsfoot roller unit. The extra-heavy roller was ballasted to deliver a compactive force of about 300 pounds psi of tamping foot surface.

Water was hauled from loading points on Carrizo Creek by three

• Deepest cut on Tucson job is represented here. A TD-24 prepares to push load Caterpillar DW-10. About 100,000 cubic yards were direct excavation and fill, while 40,000 cubic yards of borrow material were used to build up embankment.

• Progressive reduction of rock in size is shown in this picture of Cedarapids Junior Tandem crusher set up in pit near Globe, Ariz. General Superintendent Page Thiers moved in crusher setup when excavation was three-fourths completed.

Euclid tankers, of 4,200, 3,600, and 3,200-gal. capacity. Each of these sprinkling units was equipped with Hercules-driven Rex pumps capable of loading the water units in short order and applying moisture under pressure when the trucks reached the fill.

When excavation had reached its three-quarter point of completion, Thiers, like most good project superintendents, began to move in with his crusher setup. The granular material will come from two gravel pits. A Cedarapids Junior Tandem plant worked these two pits to produce the material, and also turned out whatever mineral filler was required in the roadmix treatment.

Methods of placing this material were strictly conventional. It was dumped according to volumetric measure, blade-mixed while moisture was added, then cut out in 3-in. lifts and rolled by Tampo pneumatic rollers pulled by Case and International rubber-tired tractors.

In spite of an open winter and good weather which permitted Thiers and his crew to beat a tough time schedule, none of the men will ever forget some of those early pioneer cuts which put tractors on slopes so steep that the engines lost their oil pressure.

In dramatic contrast to this mountain-type roadbuilding is a method which has been necessary in the sand

• Euclid truck end-dumps load of rock near top of Carrizo Creek hill to create new highway fill. Fills were placed by end-dump 4-ft. lifts in rock-earth combinations.

• Arizona road work is often rock work. Drilling was as efficient as the modern equipment could make it. Gardner-Denver 500-cfm compressor is supplying air to Joy wagon drill in background. Jackhammers were used in the tough places.

dune country near Yuma, where no adequate base material exists. Road construction in these shifting dunes has been interesting because here, for the first time in Arizona's roadbuilding history, sand has been stabilized in place by the addition of stiff asphalt. Such a job was completed on an experimental basis, and the new highway between Yuma and Somerton is a tribute to that type of design.

The trick in stabilizing desert blow sand seems to be to bring in about 15% of 200-mesh material in the form of silt, loess or some other such fine soil, so that the interstices can be filled. This material was added after the blow sand was roadmixed in a windrow, and further blading was then done before the windrow was picked up by a traveling Wood roadmixer and blended with about 5½% of RC-type asphalt. Later, after RC asphalt proved stiff and difficult to handle, MC oil was substituted with excellent results. This type of base is giving good service, covered only by a light armor coat, and that experimental construction shows every promise of working out in the future when roads will have to be built or enlarged through shifting sand dune areas in the western part of the state.

Flat-Country Metropolitan Job

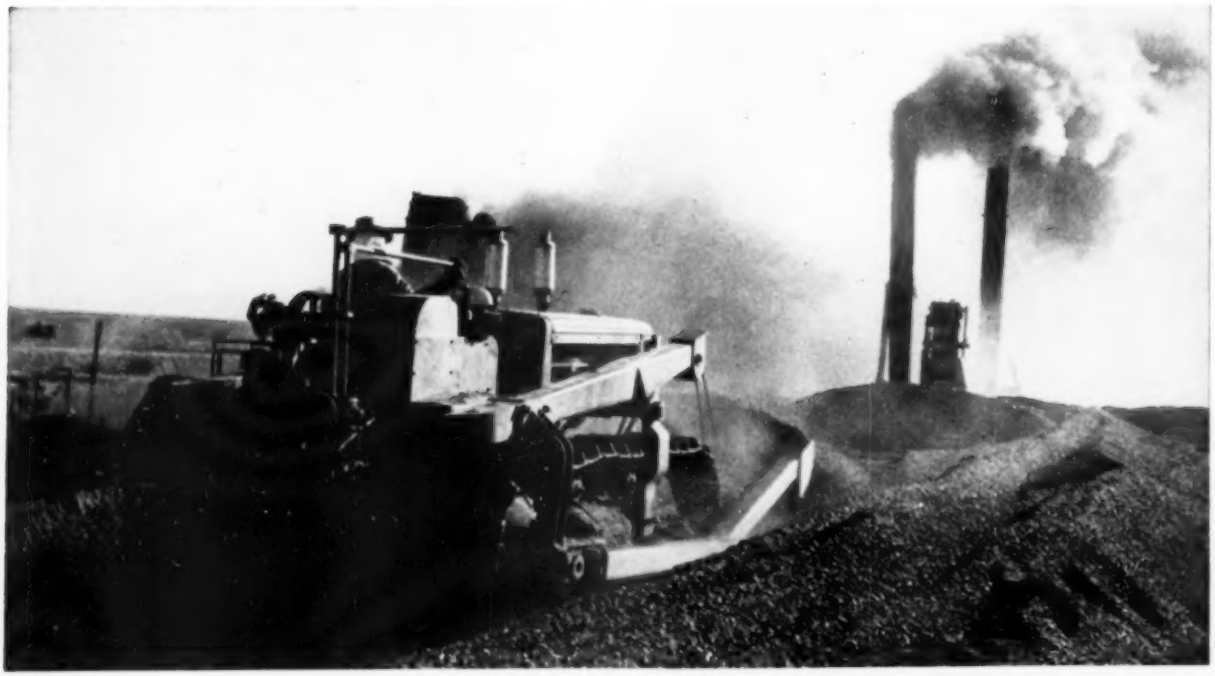
Not all jobs, however, can be spectacular. Many, in fact, are almost routine. Such a job is a 5.75-mile section on US 89 immediately north of Tucson, where Pioneer Constructors now are bringing to completion a $356,000 contract. The job typifies the vital metropolitan type roadbuilding.

This job was designed for a 40-ft. finished bituminous pavement, consisting of two inches of plant mix asphalt made with SC-6. Designed for a high traffic count, this highway is being built without shoulders, and with the usual 3-in. aggregate base course, select granular material, and high-type compaction in the subgrade. Side slopes vary from 1:1 to 4:1, and the job is in relatively flat, uninteresting terrain. The deepest fill was only 16 feet high.

This job contained a better balance in excavation quantities, and it was possible to take cut dirt and place it in nearby fills. The main equipment fleet here consisted of a 27-yd. Bucyrus-Erie B-250 scraper, a Bucyrus-Erie S-112 scraper, a 15-yd. LaPlant-Choate scraper, and two Bucyrus-Erie S-90's, both built up by sideboards. The tractor fleet included two International TD-24's, six TD-18's, four TD-18A's, all working more or less directly with the hauling scrapers and with three Caterpillar DW-10's, which also were used on longer dirt moves.

An International TD-14 with a doz-

• Near Tucson, TD-18 with Bucyrus-Erie cable controlled dozer feeds hot plant which services nearby road job. In these desert areas, modern asphaltic concrete highways have stood up well under the pounding of modern truck traffic.



er blade was assigned for lift leveling, and an International TD-18 pulling dual sheepsfoot rollers was placed on compaction. Auxiliary fill equipment included a pair of 3,300-gal. GMC-mounted semi water tank trailers, two Tampo pneumatic rollers pulled by Case rubber-tired tractors and a small TD-9. Two No. 12 Caterpillar motor graders worked with the excavating fleet to spread lifts, maintain haul road areas, and to slope whatever banks were left in the cut areas.

Dirt Job Routine

The dirt work was routine. About 100,000 cubic yards represented direct excavation and fill, while 40,000 cubic yards of borrow material were used to build up the embankment. All of this material was dug with the aid of push cats, hauled in to the job, dumped and spread, and compacted after watering so that about 130 pounds per cubic foot was developed.

But even the routine jobs usually have their share of newsworthy innovations, and this was no exception. The production of 57,000 cubic yards of select granular material and 16,000 cubic yards of aggregate base course, for example, created problems which Pioneer Constructors solved with typical contractor ingenuity. Particularly in the production of from four to 13 inches of granular sub-base material, a screening problem was created, to remove oversize particles from the stream bed pits supplying the material.

In its Tucson shop, Pioneer built a sloping grizzly device on a set of skids. The grizzly was arranged so that the Bucyrus-Erie 22-B power shovel which dug the raw material from the borrow pit could dump its dipper on top of the screen deck. Oversize particles automatically were rejected. Acceptable fines, on the other hand, passed through to a 6-yd. steel plate surge bin where slide gates could load dump trucks passing directly underneath. An International TD-9 tractor with a Bucyrus-Erie dozer helped to move this special rig, and kept the pit area clean around the shovel.

Worked 7 Hours

The Bucyrus-Erie 22-B shovel which loaded this material worked usually against a 9-ft. face, reaching up to dump the raw material against the screen. Working nine hours per day, this machine regularly loaded between 1,750 and 1,800 tons. On direct loading to trucks, the machine often exceeded 1,950 tons. So dependable was this shovel that only one cable was replaced during the entire project, and that involved no lost time on the firm's contract.

● Men like these share credit for Arizona's rapid strides in the direction of modern, safe highways. Vice President J. R. Robinson of State Tractor & Equipment Co. in Phoenix, talks to his father, President Roy Robinson of the company.

Eight GMC trucks, each hauling seven cubic yards, took the material out to the highway, dumped it on the grade, where it was bladed, watered and spread in the usual manner. Arizona specifications prohibit the compaction of granular material in lifts exceeding six inches, but on the 13-in. portions of this job a special dispensation was granted to permit two 6½-in. lifts. As quickly as possible, an asphalt plant will be moved in, the plant mix laid, final blading done, and another 5.75-mile section of modern road will be added to Arizona's main line system to serve drivers in the years to come.

Many Other Jobs, Too

Construction methods, equipment and details in the preceding jobs are being repeated all over the state, as other work is done. In the western part of Arizona, on U.S. 70 near Quartzite, contractors Wallace & Wallace are using similar ingenuity by devising at a cost of $25,000 a portable screening and crushing unit which will follow along with the loading shovel. This rig, after being fed by the shovel, will elevate material by conveyor belt to a big Universal 18 x 30 jaw crusher, arranged in closed circuit with a central screen deck.

Another mountain highway job is coming up this summer along Carrizo Creek, just below the point where Fisher is finishing up. Another large job was recently awarded in the vicinity of Benson, where more mountain highway grading will be necessary. A road through the Black Canyon country between Phoenix and Prescott now has been largely completed, and attention is being turned to the newest comprehensive roadbuilding venture, a long term program which eventually will join Phoenix and Kingman with a modern bituminous highway. The last of three main bridges in the 125-mile route has now been let for construction at Burro Creek, and the first major grading contracts are under way at this writing.

It is a big, far-flung operation, largely free from the old concepts of "stop-and-go" planning. In the Phoenix office of Construction Engineer C. B. Browning, a large map is studded with pins marking the various projects. No section of the state is uncovered. More and more, the Arizona State Highway Department is attempting within economic reason to place road alignment on a permanent basis, so that money spent now for major excavation will serve motorists for many decades in the future when roads must be widened.

Hustles with

Railside commercial site prepared fast by pair of International TD-14As

"THEY'RE POWERFUL AND FAST," owner Harold J. Anderson tells reporter in describing the performance of his two TD-14As.

the Pay Load

"My TD-14As self-load six pay yards and deliver it faster than any crawlers the same size on the market."

That's the flat statement of contractor Harold J. Anderson, out on the job where his tractors are filling and leveling a building site at Minot, N. D.

Whatever size of crawler fits your needs, there's an International model that'll come through with power, maneuverability, and good steady work, day in and day out.

Here's what Anderson says on this point:

"I've been using Internationals for four years with very low maintenance and operating costs. In fact, my first International ran three full years with no downtime for repairs."

This kind of report comes from contractors all over the country—proof that International builds real dirt-moving machines that stand the gaff.

So see the International Industrial Distributor located near you. He has the full line of International crawlers—and as a nearby source of parts, trained servicemen and complete shop facilities, he can help keep your equipment easy on the overhead for years to come.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

POWER ON PARADE. High-production International TD-14As self-load scrapers alongside burly freight engine as they prepare building site in Minot, North Dakota.

• Colorado River bottomland with high ground water table gave Pacific Pipeline Construction Co. trenches like this. Le Roi-driven diaphragm pump sucks out water and Bucyrus-Erie 22-B clamshell takes out caving sand.

Pacific Pipeliners' Plight

by Robert J. Green

High ground water table across Colorado river bottom creates difficult pipelining as crews use wellpoints to install steel pressure main for Southern California Gas Co.

AT THE east end of Heron Field, Blythe's municipal airport near the Arizona-California state line, President G. W. Abernathy of Pacific Pipeline Construction Co. got out of his car and looked around. The sight was not one to make him happy. For 2000 feet along the north edge of an exposed pipeline ditch a solid row of 18-ft. wellpoints on 3-ft. centers could be seen. Vacuum pumps and a long header line gave mute evidence by their size what a dewatering problem was being met. A 30-in. steel gas line was being fabricated close by.

Turning to his son, Abernathy said, "Man, that's pipelining the hard way, isn't it?"

His son, Superintendent J. A. Abernathy, raised no argument. For weeks now he had battled ground water. In his mind, installation of the 6½-mile, 30-in. steel pressure main from the Colorado River westward to the Blythe compressor station was one of the most difficult pieces of pipelining in his experience.

The new line is one of the important links of an artery which, when completed, will parallel a similar line leading from gas fields in Texas to consumers in California. Because of the high operating pressures involved, along with other safety considerations and general practice, design engineers of the Southern California Gas Co. specified a 48-in. earthen cover over the pipeline. This minimum cover places the bottom of the pipe at least 6½ feet underground. When the ground water table is only 4 to 4½ feet underground, as is the case in the Colorado River bottomland near Blythe, dewatering with all its allied trouble and expense is a certainty.

Pacific Pipeline Construction Co. took the job early in the winter. The contract includes everything except furnishing the pipe. It is being manufactured by Consolidated Western Steel Corp. in Los Angeles.

The river-bottom pipeline link is considered to be more than usually important, because it governs the input of natural gas into the Blythe compressor station. Gas enters the Blythe compressor plant at about 600 pounds psi, and after it is passed through the big compressors there it emerges at

• A Buckeye 48 trencher with side wings cuts tapered trench. Note that pipe is already joined so that it may be lowered-in with minimum loss of time. Speed was the only solution to the caving conditions.

something like 850. The steel walls of the 30-in. line are ⅜, 11/32, and ½-in. thick, and an actual hydrostatic pressure load on the finished pipeline will make certain that it will stand up under 1200 pounds psi. This pressure is maintained for two full days.

Canal Crossings Made

Pacific's job is a splendid example of modern high-pressure pipeline work where the difficulties of construction and the demands of a necessary design somehow have to be met and solved.

The first construction crews moved in early in December to begin a series of canal crossings. In its path across the river bottomland, the pipeline crossed nine main irrigation canals, part of the southern edge of the city of Blythe, the main runway at Heron Field, and numerous streets and county highways. Of all the crossings, the canals were the worst, because the ground underneath was badly saturated after an active year of farming and irrigation. Superintendent Abernathy realized his timing would have to be excellent when arrangements could be made to shut the water flow off, and that whatever methods he used would have to be the best.

The crossings were made quickly—often in as little time as three days. As soon as the water was shut off, a row of Stang 18-ft. wellpoints was jetted in on 3-ft. centers across the upper side of the work. Two new Bucyrus-Erie 22-B machines were also moved in about this time. One, equipped with a 50-ft. boom and a ¾-yd. Red Arch bucket, excavated the canal crossing and stockpiled the material

• At Heron Field, a continuous 2,000-ft. run of Stang wellpoints and pumps was necessary to get the trench deep enough for specified cover. A Bucyrus-Erie 22-B dragline excavates ditch in background.

● Above left: A Byers backhoe on rubber excavates trench in a more congested area of south Blythe. Above right: Cutting ditch across Heron field runway is this Bucyrus-Erie 22-B ¾-yd. dragline.

temporarily by casting. The other, which was designed for clamshell work later on, helped as a crane to assemble the pipe and get it ready for installation.

The dewatering job usually required at least 20 to 24 hours after the Stang vacuum pumps began to develop their suction. Since these canal crossings were so adequately equipped with dewatering and other equipment, the soggy condition actually gave less trouble than many of the marginal groundwater conditions later on. The pipe in the canal crossings was placed in a larger diameter sleeve section, so that future service work at these points could be done if necessary without disturbing the canal. The excavated earth was placed back with the help of pneumatic tampers so the canals would be restored to their undisturbed shape.

All of these canal crossings were made and completed before the main pipeline installation began to roll in high gear in January. The fine cooperation of Mr. Simmons, superintendent of The Palos Verde Water District at Blythe, helped make the canal crossings an easier operation.

The pipeline was manufactured in Los Angeles in the rolling mills of Consolidated Western Steel Corp., one of the major fabricators on the west coast. It was then delivered to Pacific Pipeline Construction Company Yard in Montebello where a standard double wrapped protective coating was put on the pipe to preserve it against rust, electrolysis, corrosion or other deteriorating influences. This coating consisted in order of primer, enamel, fiberglass, enamel, asbestos, enamel and asbestos. Only a 6-in. strip next to the ends of each section was left bare at this time. The covered 62-ft. sections were then trucked from Montebello to Blythe by Progressive Transportation Co., which delivered the loads after a 7-hour trip. A Lorain Motocrane and one of the Bucyrus-Erie 22-B's helped to unload the 4½-ton pieces on the job.

Field Welding Comes First

It is traditional with pipeliners to move ahead with ditch excavation and then to fabricate the pipe and lower it in place. This procedure was practically impossible because of tricky caving caused by ground water, so the traditional methods had to be reversed. The pipeline was field fabricated in the first step, with ditch digging coming along when the pipe was ready to go in.

Although the line crossed flat terrain, there were some bends to make, although it was nothing like many western pipeline jobs in mountainous terrain. "Ratchet Red" Wranock, in charge of that part of the work, tells of one 20-in. job by Enoch Smith Sons in Utah's Parley's Canyon where 93% of the total footage consists of bends. Only about 10% of the Blythe job, at most, had to be bent.

A Cinch X-25 horizontal bending machine was used for this purpose. Powered by a Continental Red Seal engine and hydraulic pumps, this powerful machine placed up to 30° of bend in a section without buckling the metal. Pipe sections for the bending machine were handled by a D7 and a Trackson side boom. As a rule, bending ruined a considerable part of the

protective coating, and this material was replaced before the bent section was welded into the line.

Welding equipment and men are all assigned to one crew, with the 4-bead field weld split evenly between two sub-crews. Equipment consists of nine Lincoln 300-ampere machines, and six Lincoln 200-ampere units. There are 13 welders in the gang, and they were responsible for joining the sections together to resist the tremendous operating pressure.

The first welding operation consisted of an electric buffing of the beveled joint edges. A stringer bead of 5/32 Fleetweld No. 5 rod was then run.

A hot pass of Fleetweld 85 was then placed on top of the stringer bead. As a rule, these two beads were run by the same welder, who moved on with his helper to the next joint.

There were two filler beads, consisting of two passes with Fleetweld 3/16 rod. The last of these passes was placed somewhat full, so that the appearance was workmanlike and husky.

Working along close behind the welding crew came an X-ray test unit, mounted on a Dodge Power Wagon and capable of going anywhere on the project. Facilities were provided on this machine for X-raying the joints at a fast pace, of developing the film on the spot, and examining the film for defects in welded joints. The X-ray unit was mounted on rubber tires, and a small electric motor pulled the outfit along through the pipe. When the machine made contact with a welded joint, a red light flashed on the control dial. A strip of X-ray film was banded around the joints to be examined, and the pictures were quickly made. Eight to 10 were developed together, and any defective welds were cut out and replaced. Practically all the joints were X-rayed.

Just as soon as the joints were approved by the X-ray crew, a crew moved in to complete the protective coating around the joints, and to repair any other coating damage. Holiday detectors were used after all the coating was in to flash a high-powered charge of static electricity against the protective coating. Any defects or holidays promptly showed up with a loud crackle as the contact unit of the device was moved around over the line.

Excavation for the Birds: Ducks!

By far the worst problem of the job was the routine excavation of pipeline ditch, hampered most of the way by saturated formations, caving and bad ground water conditions. The Colorado River bottomland around Blythe is a mixture of sand, silt, and clay lenses, many of them so arranged that they present an artesian effect.

The worst section of trench was at the east edge of the airport, where ground water came up to within 2½ feet of the surface. Two thousand feet of 18-ft. wellpointing was strung out here, with the Stang points jetted in on 36-in. centers. An 8-in. header with two Stang vacuum pumps hooked on

• Crawler-mounted Cinch bender puts bends in the 30-in. steel pipe. Hydraulic rams do the bending with this type bender. Caterpillar D7 with Trackson sideboom handles the pipe.

• Above: Welding crew, equipped with Lincoln welders, lays down the stringer bead. Pile driver at right background drives piles for new plant which will be served by gas line. Below: Crew sends X-ray machine through pipe while technician in foreground adjusts film around welds.

ran almost pipe full for 12 hours when the system was turned on. Digging was so impossible here that the entire section was mucked out by the Bucyrus-Erie 22-B dragline. As soon as the ditch was ready, the fabricated pipeline was lowered in, because the maintenance of such an extensive dewatering system is costly to say the least.

Out on the other sections of the line, where the ditch crossed fields and farms, a Buckeye Model 48 trenching machine with H&L teeth was used.

The conveyor of the machine was reversed in order to throw the dirt on the north side, because access to roads was such that the pipeline had to be fabricated on the south side of the ditch. The ditch was excavated with a 3-ft. bottom, and a ½:1 side slope was cut with the help of drag blades which winged the extra material in to the bucket line. The dumping point where the excavated dirt hit the conveyor was built up with sideboards so the machine could move along at five to eight feet per minute. There were very few good locations where this machine could line itself out on a peak-production run, because of street crossings and so on, but in straight digging the machine was capable of turning out 400 to 500 feet an hour.

No matter how rapidly the machine dug the trench, however, ground water usually began to seep in before the pipe could be lowered. When this happened, the trench began to cave. Throughout the entire job it was necessary to have a Bucyrus-Erie 22-B crane with a ¾-yd. Williams clamshell bucket on hand to work with the pipe lowering tractors. As chunks of sand and mud caved in, this machine moved in to clam the material away to a firm footing, so that no destructive stresses would be set up in the pipe through bridging action after it was lowered.

Two Caterpillar D8's and two D7's, each equipped with a Trackson winch and side boom, were used for pipe lowering. The machines usually made their lifts about 150 feet apart, using slings and wide belt-type lifters which would do no damage to the pipe covering. When the pipe was in place on a firm bed, the excavated material was replaced by a D8 and bulldozer, with a D7 often assisting. The dirt was heaped slightly to compensate for later settling, and any excess material displaced by the pipe was drifted out over the right-of-way limits. In a few sec-

tions, where a better degree of compaction was necessary, the trench was flooded when backfill reached a point close to the top.

The 48-in. cover was so difficult to get that special permission was given for 42 inches over a short distance. In general, however, the deep cover was maintained. In spite of the ground water trouble, expensive wellpointing and other problems, Abernathy had his assignment so well organized and staffed with good equipment that excellent progress was made. The first canal crossings were made in December, pipeline installation began in January, and the entire project was scheduled for completion and acceptance by February 15, 1953.

Key field personnel for Pacific Pipeline Construction Co. included, in addition to the father and son Abernathys, Bud Rowe in charge of welding; Jimmy Williams in charge of excavation, Robert Winthrop in charge of pipe laying; and William Rucker in charge of backfill and cleanup. Southern California Gas Co. was represented by Resident Engineer Al Shaw.

Mammoth Gas System

The project fits into a combined transmission-distribution-storage system unbelievably large and complex. Unnoticed, unsung, and beyond comprehension to most Californians is the engineering feat which each day brings more tons of natural gas across the Colorado River at Blythe than the combined weight of autos and trucks rolling across the huge highway bridge at the same point.

Within the 30-in. pipeline suspended from a spectacular suspension bridge at the river, and within each 24-hr. period, 405 million cubic feet of natural gas from the famous but far off Permian Basin Fields of Texas surge into California at an average speed of 30 mph. The tidal wave of energy is hammered home in the hot compression chambers of engines and compressors backed by thousands of horsepower placed along its 1204-mile length.

The first transmission line was built from central Texas to the California State line by El Paso Gas Co. Because of a general population shift westward, with attendant increasing gas demands, the El Paso concern now has under construction another line to parallel the first. (See *Excavating Engineer* for April, 1953, page 14, "Arizona's Rockiest Pipelining.")

On the California side, the transmission line branches at Blythe. One line, built by Pacific Gas & Electric Co., leads toward San Francisco and the Bay Area, carrying about half the Texas input. A second line, 30 inches in diameter, was built by Southern California Gas Co. and Southern Counties Gas Co. and carries gas toward the Los Angeles metropolitan area. The Pacific Pipeline project is a segment of a parallel leg. Other sections are under construction or have been completed in the vicinity of Indio and Cactus City.

The expansion program now under way is to be completed by early summer and will boost the capacity of the "Biggest Inch" from 405 million to 555 million cubic feet per day. It is part of a program to bring an additional 300 million cubic feet of gas into California daily.

In metropolitan Los Angeles, one of the most comprehensive distribution schemes in the nation is now in existence. Southern California Gas Co. now has virtually completed a gigantic distribution loop which circles the entire metropolitan area. Laterals lead off the distribution loop to carry gas into the city and its environs.

One of the most interesting aspects about the distribution system is the way excess gas is handled. An enormous amount of gas can be stored in the distribution system, but peak demands during winter cold snaps often require more gas than that which enters the system. Many years ago, in the oilfields at Goleta, porous rock formations were found. Excess gas charged into this formation is not only beneficial to oil flows, but in emergency times it can be partially recovered. So a gas transmission line was laid from Los Angeles to Goleta, and excess material is stored either in that line or in the vast underground reserve. When it is needed, it is recovered and fed back to Los Angeles through the two-way main.

On the loop line especially, earthwork was done to exacting standards. Because of high operating pressures in a city area, the greatest possible care was taken as the various units were built. On a 15-mile section from Inglewood to San Fernando Valley in 1951, Contractor Alex Robertson placed the pipeline as deep as 28 feet below street level, and then used special tamping equipment to place the excavated earth back so tight that street pavements could be replaced immediately to carry traffic.

Tough construction jobs have been the rule as this vast system has been built, but the bottomland pipeline crossing now finishing at Blythe equals them all for ground water and difficulty of maintaining excavation. As Owner Abernathy remarked, it was truly "pipelining the hard way."

• Backfill completes the work. Here a Caterpillar D7 tractor with cable-controlled blade works on the final step.

Let's be more

Here's The SELF-LOADING We GUARANTEE for

M-R-S 190 SELF-LOADS 12 yard struck capacity scraper using exclusive M-R-S WEIGHT-TRANSFER to gain extra weight and traction on the large 24:00 x 25 drive tires.

M-R-S 190 and 19 yard struck capacity scraper makes a short 33 ft. diameter non stop turn after having been pusher loaded. A short non-stop turning diameter of 28 ft. to 34 ft. is practical for all M-R-S tractors with different makes and models of scrapers, and is especially advantageous on narrow secondary roads.

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This powerful rubber-tired tractor is GUARANTEED to self-load a 12 cubic yard struck capacity cable operated scraper with a minimum of 27,540 lbs. of clay loam soil of normal moisture in a distance of not more than 125 feet and a time of not more than 75 seconds! Loading in this short time and distance on hauls of 500 ft. and over assures production far in excess of that possible with a crawler scraper combination of the same struck capacity.

The tremendous traction and drawbar pull that permit the M-R-S 190 to self load a 12 yard struck capacity scraper also enable it to obtain heaping loads with a 20 yard struck capacity scraper pusher loaded . . . so Mr. Contractor, you'll be in a position to bid successfully against your strongest competition with the M-R-S 190 powering your large four wheel scrapers.

For speed, versatility, and production you'll be wise to specify the M-R-S 190. Plan now to get the facts from the M-R-S dealer in your territory.

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News from the Field

• Worker demonstrates comparative ease with which Timken-roller-bearing-equipped ore car can be moved. The Quebec, North Shore and Labrador railway placed an order for 32,000 roller bearings with Timken.

Timken Bearings for Canadian Ore Cars

The Quebec, North Shore and Labrador Railway has placed an order for 32,000 roller bearings with The Timken Roller Bearing Co., of Canton, O. Every ore car on its line, or a total of 2000 97-ton ore cars, will each be equipped with 16 Timken bearings.

The Quebec, North Shore and Labrador Railway is scheduled for completion in 1954.

Prior to receipt of the order for bearings, Timken conducted an economic study which compared the costs of friction bearings with roller bearings. The study showed that roller bearings assured substantially longer service with much lower maintenance costs than did the friction type bearing. The results of this study assisted the Quebec, North Shore and Labrador Railway in its decision to select roller bearings for its iron ore cars.

The railroad will extend 357 miles north from the St. Lawrence River at Seven Islands, Quebec to within only 850 miles of the Arctic Circle, through some of the roughest terrain on the continent of North America. The line will connect Labrador iron ore deposits, being developed by The Iron Ore Co. of Canada, with the St. Lawrence River. Hollinger Hanna Limited is the operating agent of The Iron Ore Co. of Canada, a company comprised of the Hanna Coal & Ore Corp., Hollinger Consolidated Gold Mines, Ltd., National Steel Corp., Wheeling Steel Corp., The Youngstown Sheet and Tube Corp., Armco Steel Corp., and The Republic Steel Corp.

Ore shipments from the Labrador field are expected to begin in 1954. By 1955 a production of five million tons is anticipated, and this production will be increased to 10 million tons in 1956 or 1957. Long range plans provide expansion to an output of 20 million tons per year, if conditions warrant.

B-E and I-H Announce New Tractor Equip. Arrangement

Bucyrus-Erie Co. and International Harvester Co. recently announced an arrangement under which Bucyrus-Erie industrial tractor equipment will be sold, distributed and serviced by Harvester to its industrial power distributors and eventually will be manufactured by Harvester.

For many years Bucyrus-Erie Company has been an important manufacturer of equipment for Harvester's industrial tractors. Major items of Bucyrus-Erie manufacture for this purpose have been bulldozers and scrapers. This equipment has been sold direct by Bucyrus-Erie to Harvester distributors.

Bucyrus-Erie has need for addition-

Continued on page 56

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. . . . is 'way out ahead, because of new design features including stronger lips, sides and bottom, greater digging power, bigger payloads, lower center of gravity, faster dumping. Hard MANGANESE steel cutting edge of this all-welded bucket bites out the traditional "More Yards with a Yaun." Rehandling, general purpose and heavy duty, in sizes from 1/4 to 6 yards.

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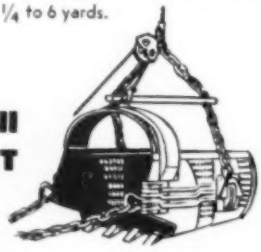

For information, write Bucket Department, Room 202.

YAUN MANUFACTURING CO., INC.
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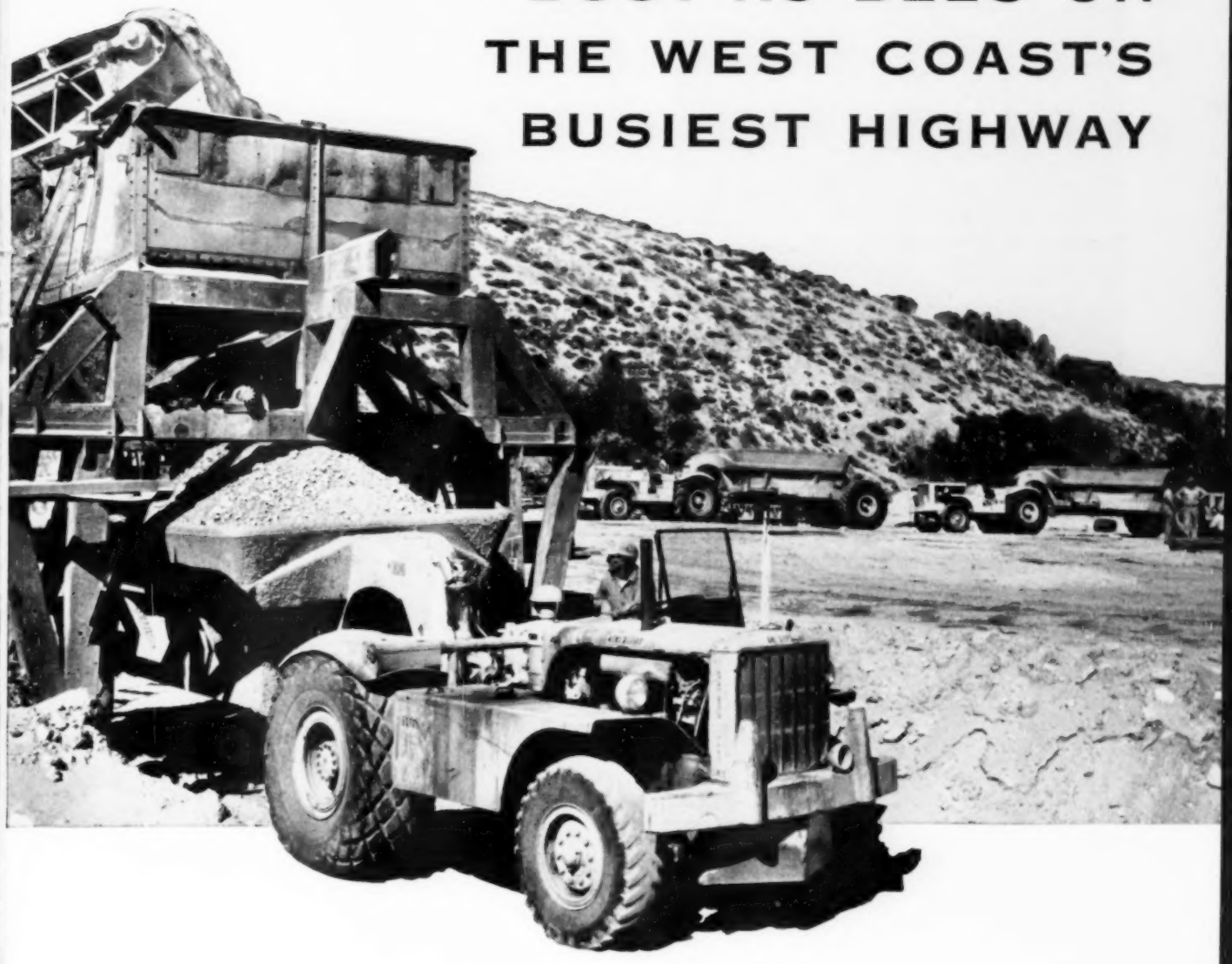

Caterpillar DW10 Tractors and W10 Wagons were the logical choice of N. M. Ball & Sons to build 11½ miles of four-lane divided highway from Gorman to Lebec, California.

The seven perfectly matched Cat* DW10s and W10s haul 3½ miles one way up a 6% grade. In a 45-minute round trip they carry 25 tons of rock base material, and by the time the job's finished, over 500,000 yards will have been moved.

You just can't beat Cat earthmoving equipment for lugging ability, positive ejection of sticky loads, speed, dependability and long life. The DW10 has a smooth, constant-mesh transmission and a heavy-duty clutch. Hydraulic power steering makes work easier for the operator, and turning radius is only 37 feet nonstop.

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Advertisement

LeTourneau pictures of the month . . .

TURNS 180° IN 15 FT— Even soft footing and a narrow fill didn't slow Ernest Markham's 6 C Tournapulls on their 600,000-yd road job near Grasston, Minnesota.

. . . with power steer, big tires, and power-proportioning differential, Tournapulls waded through soft material, spreading load of lumpy yellow clay and turning at same time . . .

. . . As last of 10 pay yd load was spread, Tournapulls completed 180° turn and hurried back to cut. Each of the 6 units moved 62½ pay yds hourly over a 6800-ft cycle.

CARRIES FULL LOAD ANYWHERE— This load of pulpwood weighs about 10 tons, yet Tournacrane handles it without outriggers, transports it smoothly without swaying. Low-pressure tires cross tracks, pavement without damage. Photo was taken in South Carolina.

1 PUSHER HANDLES 8 SCRAPERS— The remarkable part is that the 8 scrapers — all D Tournapulls — were on a short 1000-ft haul and completed a cycle every 2.6 min. The Tournatractor-pusher heaped a 5½ to 6 pay yd load every 20 sec . . . 160 loads in a 50-min hr. Load distance in topsoil and sandy loam averaged 25 ft. Tournatractor's fast positioning enabled it to back up and spot in just a few seconds. With the 9 LeTourneaus, Frysinger Construction Company graded 150,000 cubic yds (160 acres) in about a month. Work was done at Circleville, Ohio, for a new industrial film plant there.

Advertisement

performance reports from around the world

2½ MIN TO LOAD — It isn't often you see a big rig like a D Tournarocker loaded by a front-end loader. But Ft. Hartford Stone Quarry of Olaton, Kentucky teams the two to provide 100% of their limestone . . . and does it profitably! Their 9-ton Tournarocker takes 5 to 6 passes from the 1¼-yd bucket . . . is loaded with shot rock in 2 to 3 minutes. Complete 600-ft cycle to crusher takes 4 minutes. "Thoroughly sold on Tournarocker for this work," says A. C. Hall, Company President.

BEATS TRUCKS, 2½-1—Filling a sinkhole which developed on a township road near Walkerton, Ontario, Contractor Ed Waechter moved over 44,300 yds of sand with 2 D Tournapulls, 17,700 yds with 2 dump trucks. During typical 10-hr shift, each pusher-loaded 7-yd Tournapull hauled 100 loads; each shovel-loaded 5-yd truck, working same cycle, 50 loads. Day's production: 700 yds for each D Tournapull, 250 yds for each truck.

1 BUNGALOW COMING UP — There's enough lumber in this skid of Douglas fir to build a complete house. Load, about 7000 bd ft, is being towed by a Tournatractor from woods to mill. Output of 40,000 bd ft per shift doubles that of a crawler, says California Owner Roy Monschke.

LAWN ORNAMENT — We imagine one Cudahy, Wis. housewife got quite a shock the morning she saw this Tournapull practically on her front porch. She needn't have worried. Tournapull's air brakes provide ample protection for maneuvering in close quarters. And it finished the road widening job fast . . . moving 10 loads (120 pay yds) hourly on 1800-ft cycles. Rig is owned and operated by Royce Young, Auburndale, Wis.

(Continued on next page)

LeTourneau pictures of the month (Cont'd) . . .

CONQUERING HEROES—GI's who made the 1943 landing in Sicily will long remember the bloody battle for Gela Airport. It's noisy around Gela again today, but the noise is for a peaceful purpose. It comes from 2 D Tournapulls and 2 Crawlers with LP Scrapers as they help move 740,000 cu yds for an 18-mile railroad grade to connect Gela and Caltagirone. Tournapulls shown are self-loading heavy, sticky clay. They belong to Mario and Giorgio Franchetti of Rome.

100 YDS PER HR WINS JOB—On competitive demonstration at a Greenville (N.C.) asphalt plant, this D Tournapull stockpiled 20 loads of sand hourly . . . Two 91 hp crawlers, working same 450-ft haul brought in only 6 loads each hourly. All rigs self-loaded 5 bank yds per load. Based on results, Company President A. J. White bought the Tournapull.

PLOWS 1½ ACRES HOURLY — Preparing land for cotton planting near Pecos, Texas, Tournatractor deep-plows 1½ to 2 acres hourly. That's about 6 miles of furrow, with each furrow dug 12 to 14 inches deep in the hard, dry sandy clay loam. Biggest farm tractors, or heavy-duty crawler-tractors, can plow only ⅓ to ⅕ as much, according to the Texas owner.

15c PER YD — For crusher, A. T. Waltenburg, Jackson County (Oregon) Hwy Supt, needs 500 tons of gravel per 8-hr day. He brought in a 9-ton D Tournarocker to replace 2 trucks. The one Tournarocker averages 64 yds hourly to deliver all gravel crusher can handle. "A real money-saver," says Waltenburg. "Moves dirt for under 15¢ a yd." Major saving is on repairs. Tournarockers' big tires absorb shocks . . . has no frame, hinged axles, hydraulics . . . hence is seldom in shop.

Advertisement

performance reports from around the world

HEAVE-HO— Two ages meet on the Black Sea at Kozlu, Turkey. In the background, natives beach fishing boats just like their ancestors did hundreds of years ago. In the foreground, a modern high-speed Tournatractor lifts the loads from hundreds of aching backs as it levels spoil from Turkey's newest coal mine.

812 YDS OF SAND DAILY— Taking a cue from parading sailors at Lakehurst Naval Air Station, N. J., Tournapulls come and go like clockwork. The 3 "C's" shown are part of Reid Contracting Company's fleet of 5, being used at Lakehurst to help move 1,500,000 yds for runway and mat extension. "These machines give superior performance where going is roughest," says Supt Ray Saunders. Each unit has averaged 812 pay yds per 9-hr day for 6 mos. Cycles, 7000 ft.

NO TIRE BREAKAGE — After months of double-shift hauling of Florida pit rock, Maule Industries Inc report no tire troubles on their 18-ton Tournarocker. Its big 21.00 x 25 single tires rolled easily over blasted rock or quarry floor. Smaller 6 and 12 yd trucks, used on same hauls lost time due to blowouts and other tire damage. This was caused mostly by rocks wedging between the duals, or concentration of weight on a single small tire when rolling over rock fragments. Tournarocker and trucks brought shot limestone 1.8 to 2.2 miles from pit to crusher. For complete facts on this and other units shown on these pages, write **R. G. LeTourneau, Inc., Peoria, Illinois.**

LETOURNEAU LET EQUIPMENT

Tournapull, Tournarocker, Tournacrane—Trademark Reg. U.S. Pat. Off. Tournatractor—Trademark Pic-396-G

Engineer answers vital questions about the strongest wire rope made—Flattened Strand

Why does Hercules® Flattened Strand wire rope continue to outperform round strand rope by 2 to 1 or more? Can you use it? Here, Walter C. Richards, chief engineer, A. Leschen & Sons Rope Co., tells you.

More and more wire rope users are continually experiencing or hearing about spectacular performances of Hercules Flattened Strand wire rope. The explanation is clear.

First, Hercules Flattened Strand is a Super-rope because it packs 10% more steel than any round strand rope of the same size. It's 10% stronger... 10% safer.

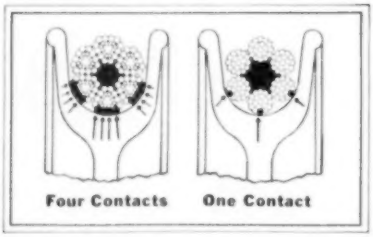
Second, Hercules Flattened Strand wears longer and more evenly. That's because there are four wires per strand contacting sheave grooves instead of one.

Third, Hercules Flattened Strand resists crushing and internal strand-cutting, because strands rest snugly against each other, keystone fashion, with less internal pressure or friction.

Fourth, Hercules Flattened Strand prolongs its own life and the life of equipment, because the relatively smooth surface of the rope prevents corrugating and wear on sheave grooves.

Can you use it?

It's a known, proved fact that no other wire rope made can equal Flattened Strand on applications such as hot ladle cranes, skip hoists, and dredge ropes. It is also best on a variety of other equipment both large and small. For many uses, it is truly a Super-rope.



With Flattened Strand, notice how four wires per strand contact sheave grooves —reducing rope and equipment wear.

But, the question is, can *you* use it to advantage? That can be answered only by a qualified wire rope engineer who is thoroughly acquainted with the characteristics and proper uses of Flattened Strand rope.

Check with the authority

That means, check with Leschen. It's wise to do so because Leschen pioneered and perfected Flattened Strand wire rope. Leschen developed special machines to make it. Leschen conducts continuing research on correct uses. Leschen is the authority.

If you discover you can use this Super-rope—Hercules Flattened Strand—you'll soon begin saving time, labor and money. Why not investigate *now?*

Hercules Flattened Strand wire rope made by
A. LESCHEN & SONS ROPE COMPANY
St. Louis 12, Missouri

In business only to make wire rope . . . better wire rope . . . since 1857

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News

Continued from page 50

al facilities for the manufacture of its products other than tractor equipment and for that reason has decided to withdraw eventually from the manufacture of this equipment for the Harvester line of industrial tractors.

Major features of the arrangement are:

1. Bucyrus-Erie will continue to supply Harvester distributors directly with allied tractor equipment until January 1, 1954.

2. After January 1, 1954, Harvester will take over the sale, distribution and servicing of Bucyrus-Erie tractor equipment, purchasing its requirements from Bucyrus-Erie up to the limits of that company's present tractor equipment capacity, and reselling to Harvester distributors.

3. Over a period of time, and without interrupting the continuity of production, Bucyrus-Erie will discontinue the manufacture of its present line of tractor equipment and Harvester will then manufacture these products.

The new arrangement will mark the first time that Harvester has undertaken the supply of a line of allied equipment to its industrial distributors.

Financial details of the agreement between the companies were not announced.

Open 88-Mile Oklahoma Toll Road

Oklahoma's Turner Turnpike — an 88 mile toll road which may become the cornerstone of an integrated system of turnpikes linking the southwest with the midwest and east—was formally opened to traffic on May 16 in colorful ceremonies at Stroud, the midway point between the Oklahoma City and Tulsa terminals.

The Turner Turnpike, a $38 million undertaking, and the first toll turnpike to be completed between the Appalachian and Rocky Mountains, links the state's two major cities.

A-C Sends Engineers Military Dozer

Allis-Chalmers recently delivered a new tractor bulldozer to the US Corps of Engineers from its Cedar Rapids, Ia., works. This four-wheel rubber-tired tractor, designed for operating scraper equipment and as a prime mover, was built for military use

• New rubber-tired tractor bulldozer was delivered to U. S. Corps of Engineers by Allis-Chalmers. Engineering and construction of vehicle, designed for operating scraper equipment and as prime mover, were done at Cedar Rapids, Ia., works.

Dwight D. Guilfoil

Dwight D. Guilfoil, 66, vice president and general sales manager of Sauerman Bros., Inc., died of a heart attack in his home in Chicago, Ill., on May 3. Mr. Guilfoil had been with Sauerman Bros., Inc. since 1913, except for a period during World War I, when he served with the 108th Engineers in France, coming out of the war with the rank of Major.

Mr. Guilfoil had been active at various times in the affairs of the manufacturers' divisions of the National Sand and Gravel Association, the Associated Equipment Distributors, and other trade associations, and was a familiar figure at the annual conventions of these groups. He was a long-time member of the Chicago Engineers' Club.

under a development contract with the Engineer Research and Development Laboratory, Fort Belvoir, Va.

Construction of the "Bull Moose," as it is called, was started in March 1952, and completed in November. Since then it has been undergoing various tests.

The vehicle is 11 feet, 7½ inches high; 22 feet, 9 inches long; and weighs 51,300 pounds with the dozer and cable control unit. The dozer blade itself is 11 feet wide and four feet high. The relatively low center of gravity and tremendous size give the machine unusual stability.

Since speed and maneuverability are essential, the unit has been designed to travel at a top speed of 25 mph pulling a 65,000-lb. towed load. The drive mechanism is of the four-wheel type—front and rear wheels on each side are geared together.

Charles Kettering Gets NSPE Award

Members of the National Society of Professional Engineers will gather in Daytona Beach, Fla., June 18-20, for the Society's annual meeting which will include the presentation of the NSPE Award to the nationally-known engineer, Charles F. Kettering.

T. Carr Forrest, Jr., of Dallas, Tex., will be installed as the organization's 15th president.

Kettering is vice president of General Motors.

Cuts Truck Prices

A reduction in the retail prices of its light, medium, and light-heavy duty R-line models of motor trucks, which it recently introduced, has been announced by the International Harvester Co. of Chicago, Ill.

The price reductions cover the com-

PERFORMANCE BUILT . . . .
Omaha Dragline Buckets are tops in performance. Wedge shaped for easier loading and dumping. Perfect balance for smoother carrying and dumping. Smooth interior to reduce friction. That means Omaha Buckets are performance built. Available in four types. Send for catalog giving description and specifications.
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GET HELP FOR HEAVY or AWKWARD LOADS

pany's R-110, 120, 130, 150, 160, 170, and 180-model series, ranging from its smallest pickup trucks through those of the 19,500-lb. rated capacity.

The downward price adjustments range from 3.5% on the R-180 series to 10.6% on the R-120 pickup models. They range from a minimum of $87 to a maximum of $152 on former list prices. The reduction in these weight categories amounts to about 6.7%.

756 Safety Posters for Your Use

Funny scenes and comic mice, or serious thoughts and sound advice—you can take your choice from the National Safety Council's new 1953 Directory of Occupational Safety Posters containing 756 miniature illustrations of colorful visual salesmen of safety on the job.

In selecting poster subjects, the Council consults the latest occupational accident statistics so that proper emphasis can be placed on the weakest spots. There are many posters for specific industries, such as chemical, mining, petroleum, textile, etc. There also is a wide selection of general themes applicable to virtually all industrial fields.

The 72-page directory contains advice to safety men on how to choose and use posters effectively, and a detailed index makes it easy to locate all posters on a particular subject.

For a free sample copy of the directory and a price schedule of posters, write the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Crystals Might Provide Clue to Tougher Metals

Tiny but "perfect" crystals, produced in the General Electric Research Laboratory, may provide a clue to metals many times stronger than those now in use.

Dr. J. Herbert Hollomon, manager of the Metallurgical Research Department of the G. E. Research Laboratory, told of the work of two G-E scientists in making microscopic crystals of zinc, zinc sulfide, and mercury without the defects usually present.

X-ray tests, as well as photographs made at high magnification, show them to be virtually perfect crystals, Dr. Hollomon said. From the amount which they may be bent and still spring back, it is possible to measure the stresses to which they are subjected. This shows them to be far stronger than ordinary crystals, he added.

Metals, as used ordinarily, consist of crystals, and there are usually defects in the regular arrangement of the atoms of which they are built. If such defects can be eliminated, theory indicates that metal strength might be increased as much as a thousand times.

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ALL LENGTHS & ALL SECTIONS TO MEET ALL YOUR JOB NEEDS
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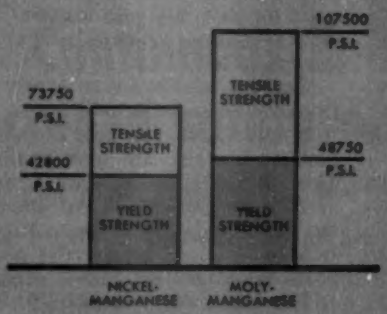
AMSCO V-MANG

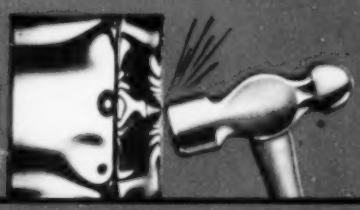
The new moly-manganese electrode that's better than nickel-manganese rods for build-up and repair



Comparison of yield and tensile strength

For full engineering and metallurgical information on Amsco V-Mang, write for technical data sheet to Amsco, Chicago Heights, Illinois.

- TOUGHER DEPOSIT
- BETTER WELDABILITY
- HIGHER YIELD STRENGTH
- LESS CRACKING



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AMERICAN Brake Shoe COMPANY

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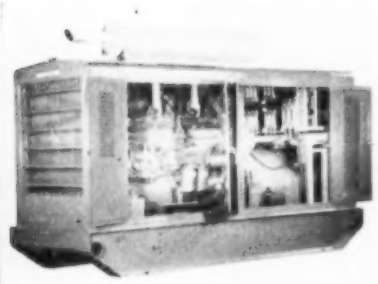
Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

Equipment You Ought to Know About



Diesel-Engine Generator

Manufacturer: Ready-Power Co., Detroit, Mich.

Claims: A new type heavy duty Diesel-engine generator is designed to improve the efficiency of large-scale arc welding operations for steel fabricating work in the field.

The 100 kw unit was built specifically for erectors of large-capacity storage tanks for liquid fuels and water. Other applications for the new generator include bridge building, and salvaging operations, and other steel work in the field requiring multiple welders.

Unit provides for simultaneous operation of a bank of seven welders, and can also power a 50 hp electric air compressor plus a drop-cord line for operation of power tools and emergency lighting.

Principal advantages the generator offers include (1) centralization of power source in a single unit for simplified control and maintenance; (2) ability to maintain welding efficiency at distances several times greater than that of gas-driven welders, thus assuring a continuous bead and avoiding bubble formation when tack is broken; and (3) portability of the rectifier, which can be easily moved as required during progress of construction, thereby eliminating the need for elevation of the power source.

The new unit, designated as Model RD24A12, is powered by an International Harvester Diesel engine. It is fully equipped with protective controls and devices. Its structural steel base has high ground clearance and a wide skid for maximum mobility and flotation over rough or soft terrain. A weather proof housing provides complete protection for outdoor operation.

Spark Plug Protector

Manufacturer: Lucas Products Co., North Canton, O.

Claims: The new activated SPAR-KOVER protects spark plugs from shorting out.

The special ceramic cartridge absorbs moisture and condensation around plugs and the water tight cover protects plugs from dew, fog, and splashing water.

SPAR-KOVERS are available for all spark plugs and can be used on any type of ignition-fired engines. Suggested applications are automobiles, trucks, construction equipment, air cooled engines, industrial trucks, marine applications, farm tractors, and portable arc welders.

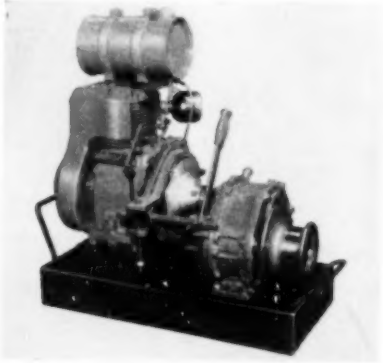
Portable Winch

Manufacturer: Stampco Products, Minneapolis, Minn. (Mailing address: St. Anthony Machine Products Co., 2424 E. Franklin Ave., Minneapolis 6, Minn.)

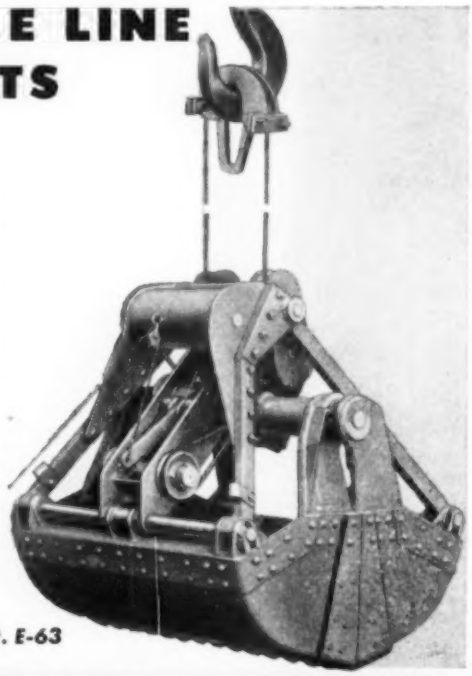
Claims: A lightweight, portable gasoline powered winch with a capstan-type drum for critical control of loads is called the Stampco Gypsiwinch. The unit is designed as a multi-purpose hoist for fast, low-cost material handling on roofing jobs and general construction sites.

Standard models are equipped with gasoline power units ranging in size from 3½ hp to 7½ hp. Electrically powered models are also available. Two gripper-type handles facilitate moving the hoist about the job while the fabricated all-steel base may be secured by ½-in. lag bolts to provide a stable platform for pulling or lifting.

The unit is said to be the first lightweight, portable winch to utilize the capstan principle. In operation, the capstan permits accurate "spotting"



ERIE SINGLE LINE BUCKETS



ILLUSTRATED is the hook-on type, for intermittent service. It is reeved and ready for operation on overhead traveling crane, monorail hoist, locomotive crane, derrick, ships tackle or any other hoisting device which has but a single hoisting drum available for bucket duty. Just slip the yoke over the crane hook.

Erie Single Line buckets are also available in the direct-reeved type for permanent installation. Describe your Single Line bucket need — we'll give you our recommendations for we build all types and sizes.

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ENGINEERING REPORTS:

OPERATING ECONOMY for the new G-E equipped Norfolk-Portsmouth tunnel is provided by its variable-intensity fluorescent lighting system, Tri-Clad* ventilating-fan motors, centralized control, and reliable power supply.

G-E FLUORESCENT LIGHTING provides safer, more uniform, shadowless illumination. To avoid light-blindness at portals, intensity is increased during bright sunlight periods.

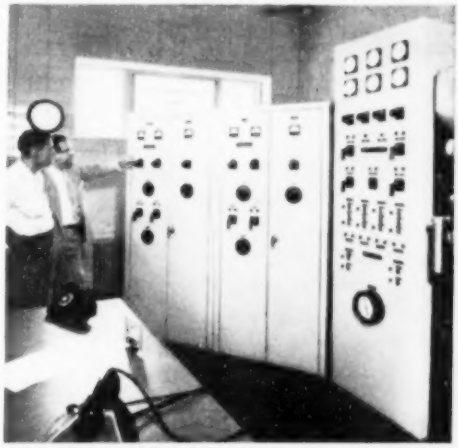
VENTILATION is provided by four exhaust fans, each driven by a G-E 2-speed, 250/40-hp motor. Motors run at high speed only in emergencies.

Continuous lines of light increase safety of new tunnel

G-E electrical system for Norfolk-Portsmouth Tunnel also features one-man control, reliable power supply

An outstanding feature of the 3350-foot tunnel, recently built beneath the Elizabeth River as part of a bridge-tunnel project linking Norfolk and Portsmouth, Va., is the electrical system that helps handle heavy traffic with greater safety and economy. The electrical equipment was designed by General Electric engineers working closely with the Elizabeth River Bridge Tunnel Commission, its consultants, Parsons, Brinckerhoff, Hall & Macdonald, who designed the system, and its contractor, Merritt-Chapman & Scott.

Let G-E engineers help your engineers or consultants on electric equipment for heavy construction projects. Contact your local G-E Apparatus Sales Office early in the planning stage. General Electric Company, Schenectady 5, N. Y. *Reg. trade-mark of General Electric Co. 664-27



ONE-MAN OPERATION is a key feature of this main control panel from which lighting, ventilation, and two G-E unit substations are controlled.

Engineered Electrical Systems for Heavy Construction

GENERAL ELECTRIC

of load, allowing the operator to "skid" the line by slacking off pressure while the capstan is rotating. Using this principle, a heavy load may be taken up and stopped very slowly, with no stress on rigging or equipment. A capstan line may be retrieved more speedily than a drum line and eliminates need for level winding.

The Gypsiwinch is also available in combination with cable drum, permitting use of either hoisting cable or manila line. Gasoline and electric power units used on the Gypsiwinch are instantly reversible and operated by a conveniently located lever control. Mechanical efficiency of more than 95% is obtained on reduction units, allowing extremely high torque and horsepower delivery.

Gears are completely enclosed for silent operation and run in a continuous oil bath. Motor, drum, and pinion shafts are ball bearing mounted. Base dimensions range from 12-in. x 32-in. on the smallest model to 12-in. x 42-in. on the largest.

Truck Scales

Manufacturer: Howe Scale Co., Rutland, Vt.

Claims: The Four-Section Straight Lever Ball-Bearing Motor Truck Scale is one answer to the problem of weighing big truck and trailer loads. It is designed as a companion unit to the Pipe Lever Ball-Bearing Motor Truck Scale.

A new scientific straight lever design is used to obtain strength with least weight. A closely controlled, high strength iron is used for all castings.

The manufacturer's ball-bearing feature has been retained and adapted to the new truck scale. This feature saves wear on knife edges and bearings, prolongs scale accuracy, and reduces maintenance.

"Inside" anti-friction plates are used to give proper clearances and to eliminate all lateral motion. Pivots are made with square ends without anti-friction points. Anti-friction points are on the main bearings and anti-friction plates are attached to the levers to absorb side thrusts, thus eliminating breakage of pivots at the anti-friction points. With conventional "Outside" anti-friction plates, pivot points can be damaged from the shock of the pivot knife edges hitting the plates. The plates can be knocked off and the knife edges damaged.

The truck scale has a capacity of 50 tons. Platform sizes are 45, 50, or 60 feet long by 10 feet wide.

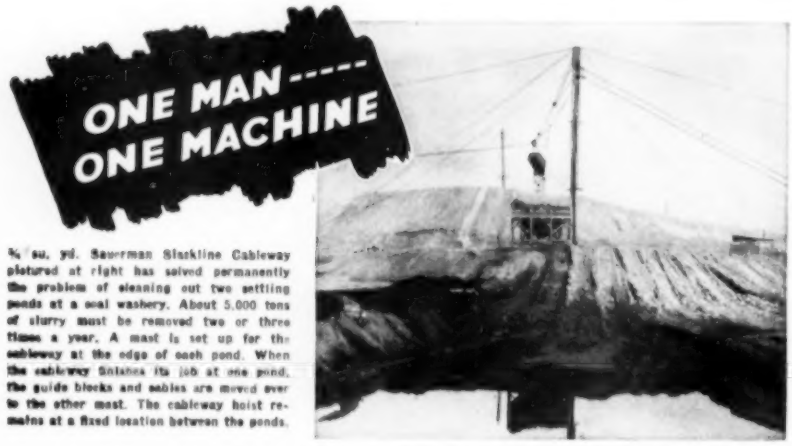
Triple Tamper

Manufacturer: Cleveland Rock Drill Div., 12500 Berea Rd., Cleveland 11, O.

Claims: TT11 Triple Hand Tamper consists of three standard No. 11 back

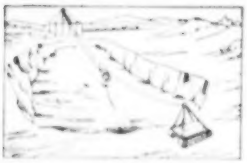
fill tampers assembled to a common head. The air control valve is incorporated in the common head for easy accessibility to the operator.

Swivel air inlet is provided for operator's convenience to keep air hose away from ground. This one man tamper can replace five hand-operated



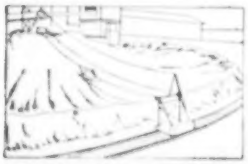
¾ cu. yd. Sauerman Slackline Cableway pictured at right has solved permanently the problem of cleaning out two settling ponds at a coal washery. About 5,000 tons of slurry must be removed two or three times a year. A mast is set up for the cableway at the edge of each pond. When the cableway finishes its job at one pond, the guide blocks and cables are moved over to the other mast. The cableway hoist remains at a fixed location between the ponds.

SAUERMAN method . . .



Sauerman Slackline Cableway

Sauerman Scraper Excavator



Sauerman Scraper Stockpiler

Simplifies Material Handling!

Wherever there are problems of long range digging or stockpiling, Sauerman scrapers and Cableways constantly prove their ability to move large yardages at low cost.

A Sauerman machine reaches across a river, bog or pond, down into a pit, up to the top of a hill or across a wide stockpile — moves material from any point within its radius, and dumps automatically wherever required. One-man control, fast action. Maintenance is easy; a few expendable parts take all the wear.

Whether your project is large or small, there is a size and type of Sauerman machine suited to your requirements — a machine that will give you years of steady service at minimum expense, no matter how tough the work it has to do.

Write us about your interests and we will send illustrated catalog by return mail.

Rope Haulage Equipment Specialists Since 1909

SAUERMAN BROS., Inc.

574 S. CLINTON ST. CHICAGO 7, ILLINOIS

tampers. Long handle bars keep operator away from tamper to avoid injury.

Specifications are: Height—40 inches; width — 14 inches; weight — 135 pounds; butt size—5¾ inches; blows per minute each butt 550; and air hose —¾ inches.

Two-Way Coupling

Manufacturer: Twinmatic Corp., 2246 S. Barrington Ave., Los Angeles 64, Calif.

Claims: A new two-way coupling for positive shut-off of air pressure

when disconnecting air hose connections is now being marketed.

The couplings have valves which automatically shut off air pressure and eliminate the need to open and close air valves at the compressor tank. The couplings enable air tools to be changed quickly and easily right at the job.

The couplings are constructed with identical type valves in each end. These are spring-seated to prevent passage of air when disconnected. Pressurized air bears against the valve ends, sealing them positively. When the couplings are connected, the valves butt against one another and depress. This opens the seats and permits a free flow of air through the coupling. Underwater tests at 125 psi reportedly show no leakage in either half of the coupling, or in the assembly. Units are precision machined to connect and disconnect easily.

Brass valves and seats are employed, and the coupling bodies are made of 356-T6 aluminum. Anodizing the aluminum enables it to withstand salt water spray tests for 1000 hours.

Cable Control Unit

Manufacturer: Wooldridge Manufacturing Co., Sunnyvale, Calif.

Claims: Especially designed for use with tractors of 130 hp or more, an entirely new extra heavy duty cable

Specify a

HEIL BODY AND HOIST

ON YOUR NEXT TRUCK

THE bigger the pay load, the better the profit . . . and when you specify Heil Bodies and Hoists, your truck will haul *more* pay load, less "dead load"! Lightweight design with great structural strength is the secret. Reinforced steel subframe welded integrally with the body and Heil no-sag body construction keep you out of the shop, on the job . . . assure extra years of service.

Time saved means money, and a Heil fast-dumping, trouble-free hoist mechanism gets your truck started back for another pay load in a matter of seconds.

Call your Heil distributor for complete details about Heil Bodies and Hoists . . . then, when you buy your next truck, *specify Heil.*

THE HEIL CO.

DEPT. 563, 3005 W. MONTANA ST., MILWAUKEE 1, WISCONSIN
Factories: Milwaukee, Wis. — Hillside, N. J.
Sales Offices: New York, Union, N. J., Washington, D. C., Atlanta, Cleveland, Milwaukee, Detroit, Chicago, Kansas City, Denver, Dallas, Los Angeles, Seattle; Rio de Janeiro, Brazil. BH-11

THERE'S A HEIL STYLE FOR EVERY DUMPING NEED

control unit employs a simplified power train comprised of only one worm gear and wheel. The unit is designated Model WD-2.

Double drums of 10-in. barrel diameter are actuated by multiple disc clutches and large surface self-energizing brakes. Full universal fairleads and large sheaves provide longer cable life and easier reeving. Company design permits mounting close to tractor for better balance and protection against damage. Anti-friction tapered roller and ball bearings are used throughout. All normal adjustments can be performed easily.

Line speed at 1000 rpm input is rated at 343 fpm with bare drum, 542 fpm with full drum. Each drum has a cable capacity of ½-in. x 235-ft. or 9/16-in. x 186-ft.

The unit is designed for use with Caterpillar D-8, Allis-Chalmers HD-20 and HD-19, and International Harvester TD-24, and may also be adapted to certain other large tractors. The Model WD-2 covers the range above that of the Model WE-2, widely used on tractors under 130 hp.

Truck-Mounted Compressor

Manufacturer: Davey Compressor Co., N. Water St., Kent, O.

Claims: A new compressor assembly

can be mounted on standard panel trucks.

The Auto-Air Model 105-VBA delivers 105 cfm at 100 pounds pressure. It is driven directly from the truck engine through a Davey P-80 heavy-duty power take-off. The compressor occupies only one-third of the truck body, leaving the remainder open for the transportation of men, tools, and materials.

Industrial Engine

Manufacturer: Ford Motor Co., Dearborn, Mich.

Claims: The Ford 134 has been designed for maximum efficiency, performance, and operating economy.

The four-cylinder, overhead-valve model engine develops 45 brake hp at 2,400 rpm. It has a 3.4375-in. bore and a 3.6-in. stroke to reduce wear and improve fuel economy.

Low friction overhead-valves help to deliver more horsepower per cubic inch displacement. Cylinders are cast en bloc of special high-grade iron and centrifugal cast sleeves are used permitting longer cylinder life. Free-turn valves are of high chrome nickel alloy.

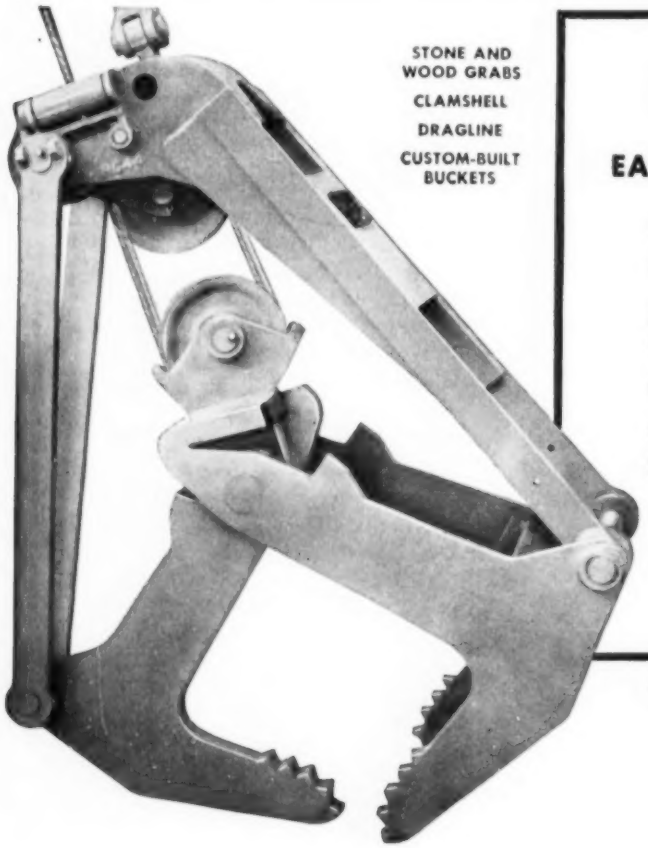
Heavy-duty replaceable thin-shell precision copper-leaded bearings add to efficiency. The oil system has a full-flow filter with renewable element that cleans all engine oil and reduces ring wear. Full-length water jackets completely surround each cylinder, simplify cooling and provide better temperature control.

'Broach Fit' Bushings

Manufacturer: Aeroquip Corp., Jackson, Mich.

Claims: New "broach fit" bushings offer advantages that eliminate many of the cost and production problems associated with the use of conventional-type bushings.

The bushings provide precision results in thousands of applications where thin-walled, hardened steel bushings are required. Because of their low cost, they fit the needs where bushings should be used but are not



STONE AND WOOD GRABS
CLAMSHELL
DRAGLINE
CUSTOM-BUILT BUCKETS

WELLMAN

EASY HANDLING OF LARGE STONES

• Those big stones won't slip from the Wellman Stone Grab. Four-part closing cable reeving develops tremendous closing force on stones. Model shown has 5-ton capacity, 4½ foot jaw spread. Other capacities available.

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THE WELLMAN ENGINEERING COMPANY
7000 Central Avenue
Cleveland 4, Ohio

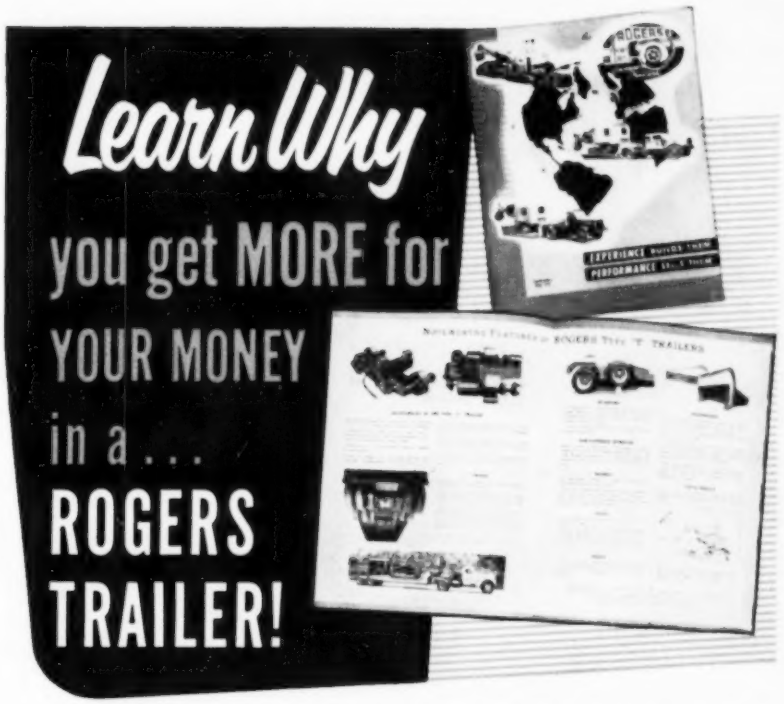
because conventional types are too costly . . . or where high precision bushings are used even though a less expensive type would serve equally well.

The unique bushing feature is the broached outer surface which creates dozens of hard-cutting edges. The bushing actually cuts its way into cast metal, plastic, steel, and other metals without danger of collapse or cracking the parent metal. This eliminates the need for expensive, close tolerance hole making.

For instance, where conventional type bushings require hole tolerances of 0 to .0005 of an inch, broach fit bushings provide uniformly accurate results with a maximum tolerance of .002 of an inch.

A smooth surfaced, slightly undersized pilot on one end squares the bushing with the hole thereby eliminating the possibility of cocking during assembly. As the bushing enters the hole, chip retainer grooves gather displaced metal. This creates a lock which holds the bushing firmly in position after insertion. Broach fit bushings may be removed, if desired, and replaced with accuracy without reworking the hole.

The bushings are made of hardened steel treated with a black oxide penetrate to prevent rust and corrosion. They are available in a wide range of standard sizes in both "headless type" and "head type," and special



You'll find the new catalog interesting and informative in terms of the complete line of Rogers Trailers, one or more of which will best suit your job hauling requirements.

A "point by point" comparison of Rogers specifications and construction features with those of other trailer makes is your best assurance that you'll get MORE for your Money in a ROGERS TRAILER.

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Divided bed, tilt deck trailer with gooseneck.

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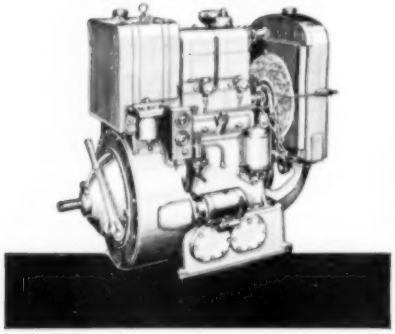
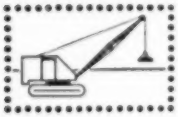
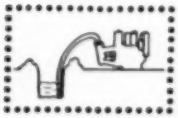
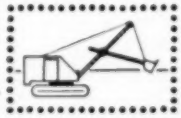
Save Money
ON SCORES OF CONSTRUCTION POWER JOBS...



with NORDBERG Diesel Engines







• THESE are just four of the scores of construction powering jobs you can handle better, at lower cost, with Nordberg Diesel Power Units. Built in 1, 2 and 3-cylinder sizes, these compact, heavy-duty units provide from 10 to 45 hp, or 6 to 30 kw for around-the-clock construction service. *Get the facts today. Clip the coupon now.*

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sizes can be furnished on request to the manufacturer.

Folding Trailer

Manufacturer: Martin Machine Co., Kewanee, Ill.

Claims: Equipment up to 75 tons is loaded, hauled, and unloaded with ease and facility with the F075M "Folding

Gooseneck" trailer. The trailer unfolds to form its own loading ramp, up which heavy, 75-ton units are easily

run onto the broad platform. A winch-equipped truck lifts the folding neck and the load is ready to go—a one-man, five-minute operation.

In transit, the low platform offers a groundlike stability that keeps equipment riding snug and secure. At the other end of the line, whatever the job conditions, the trailer gently kneels to allow its load to run off under its own power.

The trailer has a 12-ft. x 24-ft. platform, with an overall length of 43 feet. It rolls on 16, 11.00 x 20 12-ply tires, mounted on multiple oscillating trunnions. "Folding Gooseneck" trailers are available in single and tandem axle models with capacities from 12 to 100 tons.

Jackdrill

Manufacturer: Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Claims: An air-leg rock drill combination is designed as a completely integrated unit. Known as the JR-38 Jackdrill, it has features not available in Jackhamer air-leg combinations. Most radical innovation is a built-in air coupling between the drill and the feed leg doing away with the third hose necessary in previous combinations.

The control valve for feed leg pressure is built into the backhead of the drill where it is always convenient to the operator. In addition, the feed leg pressure can be shut off with the throttle valve which controls the operation of the drill. This feature elim-

inates feed leg pressure adjustment everytime the drill is moved for another hole. The backhead is designed so that flushing water is turned on when the throttle is opened.

The universal Jackdrill can be used either as a drifter, stopehamer, or Jackhamer. For Jackhamer use, the feed leg is detached from the drill by simply loosening the coupling nut and is ready for use without any further adjustment.

Concrete Cutter

Manufacturer: Felker Mfg. Co., 1125 Border St., Torrance, Calif.

Claims: A new low cost DI-MET concrete cutter is known as Model 135.

This model, of three-wheel design, is specifically designed to provide high power with light weight. It utilizes a 13.5 hp gasoline engine driving a standard 12-in. diameter diamond blade which cuts to 3½-inches deep. Larger blade diameters up to 18-in. o.d. are accommodated.

Blade is mounted on a single end spindle equipped with Dodge SC self-aligning ball bearings. The diamond wheel is protected with a guard, the front half of which is hinged to raise out of the way. This permits instant cutting close to curbs, walls, etc. where an ordinary guard must be first removed, causing unnecessary delay.

Blade depth adjustment is by a manually operated screw which gives a fast, uniform rate of feed. The base casting, of light weight alloy is mounted on three Colson Durex Bearing wheels. The rear wheel steers by means of the hand wheel. Handles provide quick maneuverability. Coolant to the Model 135 is by external hose connection. Slotted blade collars pick up the coolant, eject it under centrifugal force over both sides of the wheel.

Battery

Manufacturer: Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia, Pa.

Claims: Twenty per cent more ca-

ANOTHER *ESCO* MONEY SAVER!

New 7" Box Point-

for rock shovels in the 6 yard class

***ESCO* R7R Increased point life 340% on one hard rock shovel job!**

Point life goes up, cost per yard goes down—with this new *7-inch* shovel point. The self-sharpening R7R is made bigger to give longer point life in tough digging. For example, on one rock digging job, average point life jumped from 10 to 44 hours when the new R7R was used—a 340% *increase!* At another installation, where tonnage had been averaging 76,000 tons per set of teeth, the new R7R points boosted production to 155,000 tons—a 100% increase! *In both cases the ESCO R7R points cost less than the teeth they replaced.*

ESCO Points and Adapters speed your digging. You change a box point in 1¼ minutes. Result: less down-time, increased profit per yard. Your *ESCO* dealer has box points available in six different shapes to meet all digging conditions...widths from 3" to 7". Ask him for details, or write for Bulletin 187-A:

Change 4 points in 5 minutes with ESCO Adapters

Representatives in all Major Cities

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Offices and Warehouses: Honolulu, Hawaii; Houston, Texas; New York, New York; Los Angeles, San Francisco, California; Seattle, Spokane, Washington; Centralia, Pennsylvania; Eugene, Oregon; Salt Lake City, Utah. In Canada: Vancouver, British Columbia, and Toronto, Ontario.

ELECTRIC STEEL FOUNDRY CO.

2177 N. W. 25th AVENUE, PORTLAND 10, OREGON 712 PORTER ST., DANVILLE, ILL.

pacity in the same space is claimed for the new T-H Exide Ironclad battery.

The new battery now incorporates new materials and structural changes to give increased capacity. In modern practice, this increased capacity is needed in many materials handling and haulage jobs to work through a full shift.

Polyethylene non-oxidizing slotted plastic tubes keep the active material in constant contact with the grid spines, yet permit free electrolyte penetration throughout the active material. An added feature is the polyethylene acid-proof tube-sealer fitted to the bottom of the positive plate, which seals in the active material and maintains high battery capacity for a longer working life.

Positive plates in this new T-H Exide Ironclad are larger, and are balanced by extra heavy negative plates. Almost indestructible pormax separators, new homogenized sealing compound, and new seamless rubber jars are other features contributing to the unusual quality and performance of this new battery.

Steel trays are sprayed with a plastic coating which is both acid-resistant and also possesses high insulating qualities. New quarter-turn unbreakable plastic vent plugs facilitate quick and easy servicing with water when the battery is low.

Welding Helmet

Manufacturer: United States Safety Service Co., 1215 McGee St., Kansas City, Mo.

Claims: The new SAF-I-WELD welding helmet is made of fiber glass

which has greater strength-weight ratio.

The SAF-I-WELD is strong and durable but very light in weight. Fiber glass is highly resilient and will not split, crack, or deform and these features greatly add to the life of the helmet.

The headgear has a patented position hinge which locks helmet in "raised" or "working position" and is adjustable to fit any head size. The one piece seamless shell is resistant to warping from heat or moisture and meets the A.S.A. code for electrical conductivity and strength. It is available in a light green color.

Hand-Winch

Manufacturer: Department KP, St. Anthony Machine Products Co., 2424 E. Franklin Ave., Minneapolis, Minn.

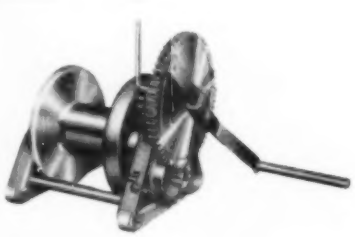
Claims: A mechanical hand-winch with low gear load capacities up to 10,000 lbs. is designed for optional use with a 1-in. electric Skildrill.

The HANDIWINCH is highly suitable for construction and industrial uses where heavy pulling or lifting is required. It is portable, of all-steel electric weld construction to combine strength with light weight, and has both high and low gearing for job versatility. Brake design allows for safe accurate load spotting with finger pressure control, and features a self-operating ratchet ring. The heavy duty, chisel-type, spring loaded dog permits jam-proof operation of the braking device. Machine cut gears and precision fit, self lubricating bronze bushings on the equipment cut friction to a minimum.

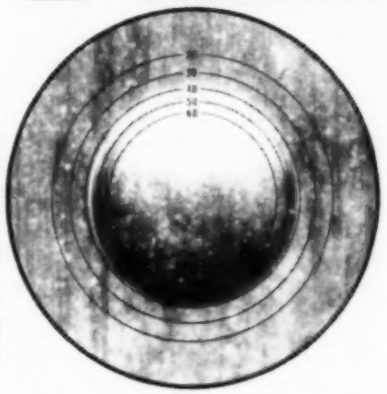
Load capacity at low gear is 10,000 lbs. at 27:1 reduction; capacity at high gear is 1,900 lbs. at 4.5:1 reduction.

The hand crank drive shaft is fitted with a large ball retainer; the crank can be safely left in gear and at a minimum radius provides flywheel action for smooth control in lowering load.

Provision is made in design for the attachment of a 1-in. Skildrill or similar power source for electric operation of the HANDIWINCH, enabling the operator to handle loads up to 1,000 lbs. at 10 fpm. The power source is connected with a special HANDIWINCH adapter.



Steel Hardness Tester



Manufacturer: Pacific Transducer Corp., 11921 W. Pico Blvd., Los Angeles 64, Calif.

Claims: Now being offered is a new low cost portable pocket tester for determining the hardness of steel alloys and other metals in the range from 25 to 65 Rockwell "C" scale.

The hardness tester may be used to test specimens of steel alloy in almost any place or position. It is a direct reading device. No further calculations are required.

The test includes a microball indentor, a measuring microscope and a standard hardness test block. It operates by means of an impact indentor which drives a 1/16-in. tungsten carbide ball a short distance into the sample to be tested. The diameter of the indentation is then measured by the reticulated microscope. As the

Continued on page 72

Model
30-M
(30,000
G.P.H.)
RICE
Self-Priming
CENTRIFUGAL PUMPS
Engine, belt, and electric driven pumps with many new features to give you low cost, dependable performance. A. G. C. rated. Easily replaced wearing parts keep Rice Pumps young at low cost.
Write for special bulletins.
RICE PUMP & MACHINE CO.
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FOUR MARION *111-M SHOVELS*

Helping Build SOUTHERN HEMISPHERE'S BIGGEST EARTH DAM

The Southern Hemisphere's largest earth embankment, Big Eildon Weir in Victoria, Australia, is moving along steadily on its 5-year schedule — with the help of four MARION 111-M shovels.

The machine shown here is excavating for the powerhouse site. All are equipped with extra-heavy duty 3½ cubic yard dippers that keep a big fleet of heavy haulage units busy.

The dam will be half a mile long and 260 feet above river bed. The catchment area sprawls over 1500 square miles, and the impounded water will provide tremendous irrigation and power generating benefits for a large area.

The reasons why MARION 111-M machines are selected for big, hard jobs are understandable when its design, construction and performance features are understood. Let your nearest MARION office give you the facts.

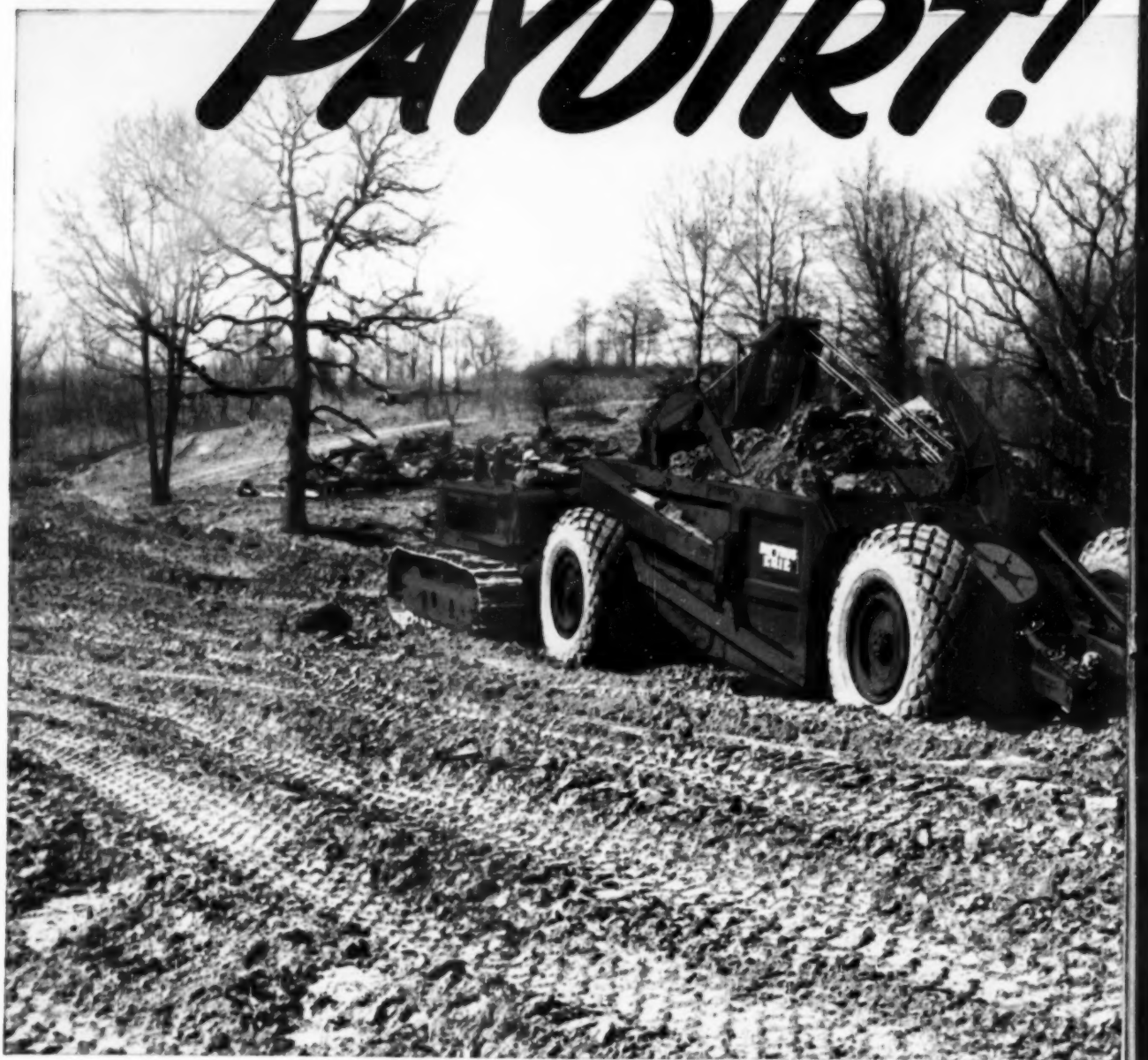
MARION POWER SHOVEL CO.
MARION, OHIO, U. S. A.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES

from ¾ cu. yd. to 45 cu. yds.

BIG RED TEAM *

PAYS OFF WITH MORE PAYDIRT!



BIGGER LOADS EVERY TRIP . . .

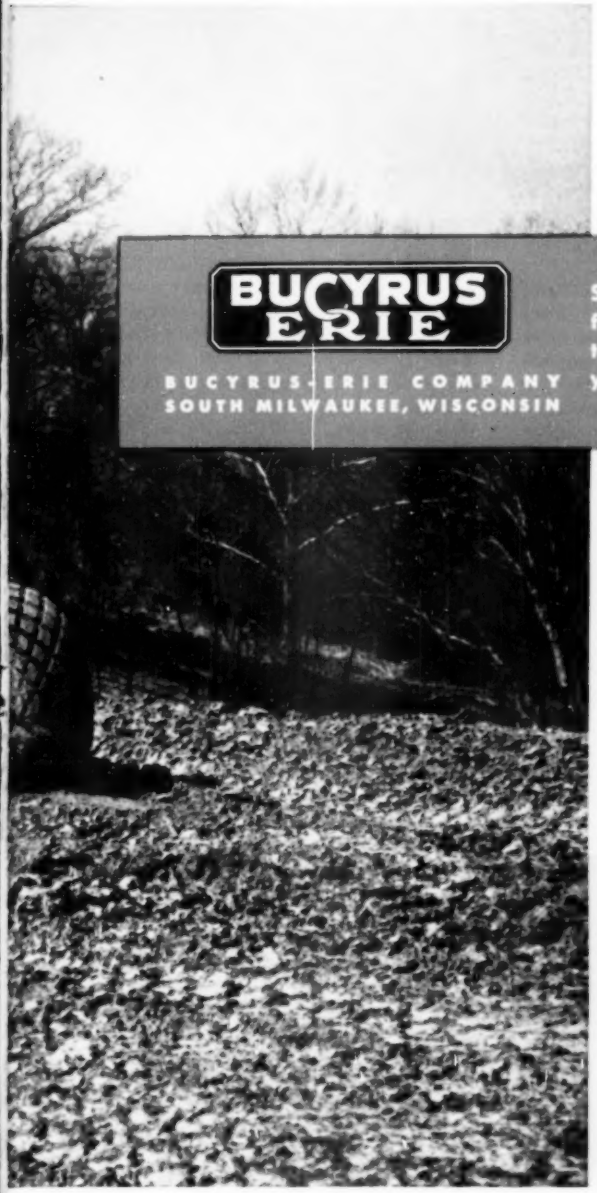
You get heaped loads faster with a Bucyrus-Erie scraper's boiling-action loading. This has been proved time and time again in actual field tests. The loading action breaks up big chunks to give you a compact and uniform fill, and extra pounds of dirt in every cubic yard.

MORE TRIPS PER DAY . . .

Big tires, low center of gravity and increased all around stability give you the flotation and maneuvering ability for extra trips every working day. The streamlined gooseneck permits short turns. Dumping is quick and clean with positive rolling ejection. It all adds up to faster hauling cycles . . . and more dirt moved per day.

11T53C

Bucyrus-Erie scraper and TD-24 tractor



BUCYRUS ERIE

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See your International Industrial Tractor Distributor soon for all the facts about the Big Red Team . . . it will pay you to use the equipment that delivers the most paydirt for your money.

THREE *B*-TYPE SCRAPERS TO CHOOSE FROM

Model	Capacity	
	Struck	Heaped
B-250	22 cu. yd.	27½ cu. yd.
B-170A	16 cu. yd.	21 cu. yd.
B-113	10 cu. yd.	14 cu. yd.

SEE YOUR INTERNATIONAL INDUSTRIAL TRACTOR DISTRIBUTOR

New Equipment

Continued from page 68

diameter is a function of the hardness, the recticle indicates the hardness directly.

The instrument lends itself particularly to use by field engineers, maintenance engineers, sales engineers and plant engineers. It is adapted for testing all parts of large dies, punches and large welds as well as for structural steel, tanks and large pipes in position where only a portable hand tester of this type can be used.

Ejector Extensions

Manufacturer: Caterpillar Tractor Co., Peoria 8, Ill.

Claims: Ejector extensions are now available for five models of Caterpillar scrapers. The extensions are designed to increase loading efficiency and decrease loading time.

The extensions, available as attachments for the Nos. 80, 20, 21, 70, and 15 scrapers, are made of steel bars welded together and attached to the top of the ejector. Scrapers equipped with ejector extensions will be particularly valuable when working in moist, sticky soils that have a tendency to peel up into slabs and break over the back of the ejector.

The extension reduces spillage, and thus lessens the chance of cable fouling. By the same token, loading time is reduced. Attaching ejector extensions to the scraper will not hinder shovel or dragline loading.

Side-Dump

Manufacturer: Easton Car & Construction Co., Easton, Pa.

Claims: The new lift door side-dump truck body, capacity 30 tons (iron ore), is the largest of its type.

Designated as Model BL-1530 the body follows the manufacturer's standard lift door design except for the special floor reinforcing plates of 4-in. x 1-in. abrasive resistant steel welded into position. Dumping is accomplished by means of an external overhead hoist. The body is mounted on a Dart Model 300 Diesel-powered 6-wheel chassis.

Electrode

Manufacturer: Stoody Co., Whittier, Calif.

Claims: A new electrode recently marketed under the name Stoody Build-Up has been developed to provide the exact properties necessary in a material used for rebuilding carbon steel and alloy steel parts—sound deposits, high tensile strength, toughness, and resistance to cold flowing. As an underbase it is generally recommended for such parts as drive sprockets, churn drills, shovel drive tumblers, and house rolls, tractor rollers and idlers, tool joint shoulders and clutch jaws.

An extruded alloy-coated electrode, it is designed to produce an alloy steel deposit of consistent medium hardness of 29-31 Rockwell C under normal conditions. Deposits are affected by heat treatment and will react to abnormal temperature ranges like any other alloy steel.

While Stoody Build-Up is not a hard-facing alloy and not intended for such applications, it has certain limited uses as a final overlay on equipment where impact is the principal wear factor—steel shafting, gears, and tractor rails. Deposits are machinable with high speed tools.

Tamping Roller

Manufacturer: Southwest Welding & Manufacturing Co., Alhambra, Calif.

Claims: A new extra heavy duty tamping roller, model 2D10-WS, features twin drums with solid wedge-type feet.

When loaded with sand it exerts a tamping pressure of 1250 psi. Water ballast may be used for lighter pressures. Like other rollers produced by this company, the new wedge-foot model has an oscillating yoke which allows a full tamping effect on uneven ground. Drum is five feet diameter by five feet long.

Braided Sling

Manufacturer: A. Leschen & Sons Rope Co., St. Louis 12, Mo.

Claims: A new eight-part braided sling features an entirely new type of reusable thimble fitting that is reported to save sling users up to 20% or more.

These Pin-Lock thimbles are attached by pins instead of conventional hammered-down clamps — and are readily removable for reuse. Since sling fittings generally outlast the sling itself, substantial savings are gained by the reuse of them.

For example, on a sling made of ½-in. wire rope, of 10-ft. length, it is claimed that reuse of two full thimbles produces a saving of 23.6%. On a 10-ft., 3/32-in. rope sling, reuse of thimbles saves 8.5%.

The braided sling itself is a new product. It has been introduced after months of development work and job-testing, including tests in one large plant where the sling was subjected to 20% "over-abuse" and showed no evidence of undue wear.

Clutch

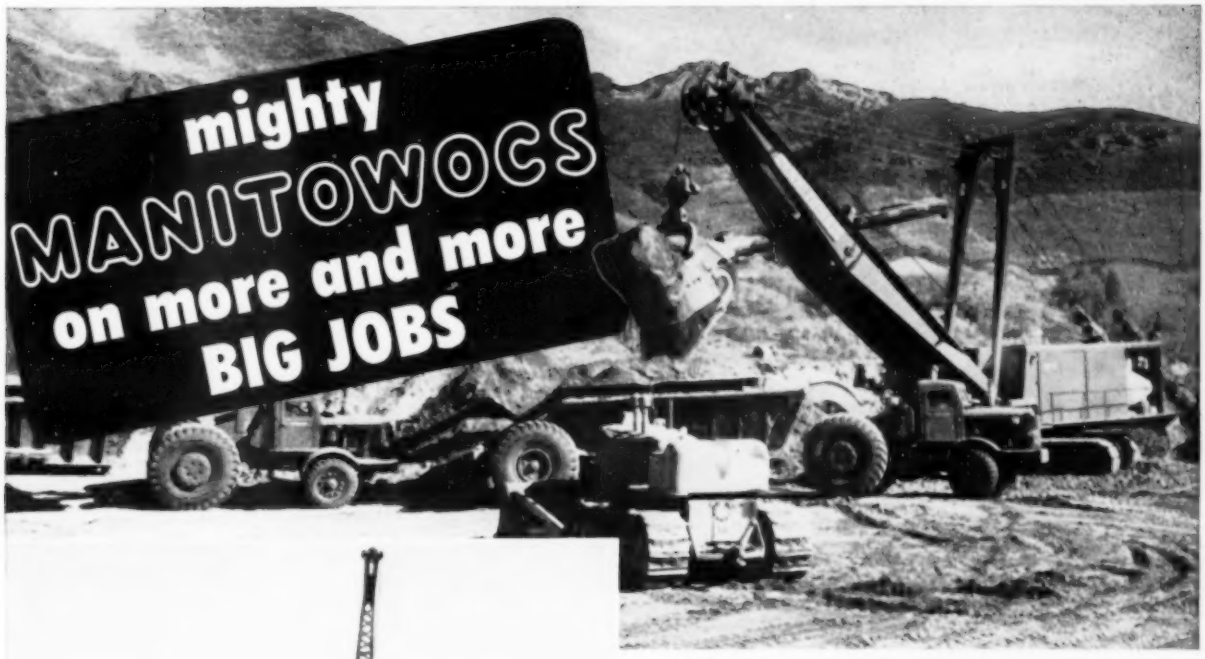
Manufacturer: Briggs & Stratton Corp., Milwaukee, Wis.

Claims: A new clutch has been installed on the manufacturer's 9FB, 14FB, and 23FB engines.

The clutch is manually operated, compact, and has ample capacity for every operation within the power range of the engines. This dry plate, over-center type of clutch, mounted directly to the engine crankcase, provides positive neutral and power engagement.

The power take-off shaft is carried in a double thrust ball bearing. No lubrication is required other than occasional greasing of the bronze throwout bearing.

mighty MANITOWOCS on more and more BIG JOBS



PALISADES DAM — Two Model 4500's owned by J. A. Jones and C. H. Tomkins each handling over 10,000 yds. in 20 hr. shifts.

CHIEF JOSEPH DAM — Model 4500 Dragline owned by Columbia River Constructors, on a really tough excavation job at this huge dam near Bridgeport, Wash.

FOLSOM DAM — Model 4500 Dragline owned by Merritt-Chapman & Scott-Savin, loading trucks. Another Manitowoc 3900 also on job.

There's a big switch to Manitowoc all over the country — big jobs, small jobs — big contractors, small contractors — are all replacing with mighty Manitowocs.

They've found what they're looking for — the power and speed for big yardage — the extra heavy, rugged construction for long life — the simplicity of design for lower operating costs — the quick convertability for greater versatility — the ease of operation for operator comfort and productivity.

No other excavator can match a Manitowoc in performance — because no other excavator has the built-in features and extra values found in a Manitowoc.

May we prove it to you? Send for catalogs on the mighty Manitowocs, now. Manitowoc Engineering Corp., Manitowoc, Wisconsin.

MANITOWOC

SHOVELS 1-5 YD. — Speedcrane — CRANES 18-100 TON

"This Cat's record speaks for itself..."

... says D. K. Pickens, whose Caterpillar-powered Manitowoc shovel is shown at an open gravel pit near Paducah, Ky. After four and a half years of dusty, hard digging, here is the record of this D17000 Diesel Engine:

LONG LIFE: More than *12,000 hours* on the meter *without major overhaul*, thanks to the simplicity and ruggedness of Caterpillar construction.

HIGH OUTPUT: Stripping clay overburden is tough, but this Caterpillar 2½-yd. shovel moves 2,250 tons in a 16-hour day.

REAL ECONOMY: Fuel consumption averages only 8 gallons per hour. All Caterpillar Diesels get full power from money-saving No. 2 furnace oil without fouling. Low repair bills mean a big saving, too.

Leading machinery manufacturers can supply Caterpillar power in their products. These rugged, reliable Diesels are available in 12 sizes, up to 500 HP and 315 KW.

Talk over your power requirements with your Caterpillar Dealer. Let him show you how it pays to standardize on Cat* power for long engine life, operating economy, and fast, dependable service.

CATERPILLAR, Peoria, Illinois.

CATERPILLAR*

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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

NOT in the *Contract*

An agitated young wife called up a friend to tell her about a quarrel she had had with her husband.

"And now he's left the house," she added tearfully.

"Oh, I wouldn't let that worry you," said the friend. "After all he's done that before."

"Yes, I know," sobbed the unhappy wife, "but this time he's taken his bowling ball."

Two men in a dining-car were ordering breakfast. The first one said to the waiter:

"George, you may bring me two fried eggs, some broiled Virginia ham, a pot of coffee and some rolls."

The second man said: "Bring me the same." Then added, "Just eliminate the eggs."

"Yassa."

In a moment the waiter came back.

" 'Scuse me boss, but just what did you all say about dem aigs?"

"I said eliminate the eggs."

"Yassa." And the waiter scurried back to the scullery. In a moment he came back once more, leaned confidentially and penitently over the table and said:

"We had a bad accident jest afo' we leave de depot dis morning boss, an' de 'liminator done got busted off, right at de handle. Will you take yo aigs fried same as dis hyar gemman?"

Patrick, suffering from toothache, got up enough nerve to visit his dentist, but lost it again when he was about to get into the chair. The dentist told his assistant to give Pat a tot of whiskey. "Got your courage back now?" he asked.

"No," replied Pat. So, a second tot was brought and a third.

"Now have you got your courage?" asked the dentist.

Pat squared his shoulders. "I'd like to see the man," he said, "who'd dare to touch me teeth now!"

On their golden wedding anniversary the old lady was asked:

"In all these years have you ever thought of divorce?"

To which she replied: "No, only of murder."

Maid: "While you were gone, Ma'am, little Willie swallowed a bug, but don't worry—I gave him an insect powder."

Keeper: You think you're sane, eh? Well, if we give you your liberty will you keep away from liquor and women?

Asylum Inmate: I certainly will!

Keeper: Then you stay in. You're still crazy!

A pretty, fluttery young woman approached a saleswoman at the yarn counter of a department store for instructions on how to make a dog's sweater. "How big is your dog?" asked the saleslady.

The young woman tried unsuccessfully to describe the size of the dog and finally the sales woman suggested: "Why don't you bring him in and let me measure him?"

"Oh, I couldn't do that," the distressed woman answered, "I want it to be a surprise."

A little old lady entered a suburban bungalow and found a lad of four in sole possession, playing with his toy train.

"You don't know me," said the old lady, "but I'm your grandmother—on your father's side."

Without looking up from his train, the lad replied, "I'll tell you right now: you're on the wrong side."

And then there was the persistent lawyer who spent a whole evening trying to break a girl's will.

"Look here, Smith," said the contractor to his shovel runner, "you and Jones both started your shovels at the same time, an' he's now got a bigger pile of dirt than you have."

"Well, he's diggin' a bigger hole," said Smith.

"Here's a full day's pay — now go home."

New trade literature

Subject: **Diesel Tractors**
Content: Fuel cost savings of Sheppard full Diesel power are stressed in a new colored bulletin on industrial tractors just released by the manufacturer. The maneuverability of the wheel type tractors is illustrated by the SDI-3 working with a Lull shoveloader, Hopto digger and special purpose units for mines, quarries and railroads.
Where to get: Sheppard Diesels, Hanover, Pa.

Subject: **Sewerage**
Content: A 674-page book on *Sewerage and Sewage Treatment* has just been released by John Wiley & Sons, Inc. of New York. The book is in its seventh edition; the latter part of the sixth edition has undergone revision. In addition the preparation by accepted authorities of standards for design in the entire field of sewerage has required extensive changes in the first half of the book. The autnor, Harold E. Babbit, is an acknowledged expert on sewage treatment, water purification, garbage disposal, diatomite water, and flow of sludge. He is professor of sanitary engineering at the University of Illinois where he started his teaching career as an instructor in 1913. Completely modernized to make it more valuable, the seventh edition retains its original authority and practicality. Illustrations, tables, and appendix are included in the book.
Where to get: John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

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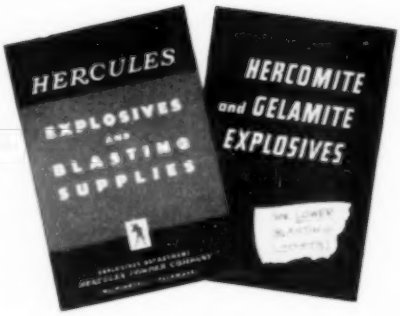
Dept. EE-2 Box 5939, Kansas City 2, Mo.

Subject: **Maintenance**
Content: A simple and easily followed maintenance program has been developed for Euclid earthmoving equipment. The 20-page publication not only explains the operation of the program, but provides owners with a detailed outline of all points that should be checked at 100; 500; 1000; 2000; and 4000 hours of operation. All forms necessary for installing and operating the program are illustrated along with the maintenance check sheets used. These are patterned after those used in aircraft maintenance. Paper work can be taken care of in a few minutes a day and the program is easily installed or adapted to operations where a preventative maintenance program has already been established. Heart of the program is a control system which notifies the shop when regular servicing intervals are due, checks on whether or not the work has been done, and provides an easily kept record of repair costs, fuel and oil consumption, and equipment availability.
Where to get: Euclid Road Machinery Co., Cleveland 17, O.

Subject: **Explosives**
Content: Two new booklets—one containing the latest information on Hercules Powder Company's complete line of industrial explosives and blasting supplies, and the other containing up-to-date information on the company's ammonium nitrate dynamites and semi-gelatins—are now available from the manufacturer. The booklet lists all of the company's explosives and blasting supplies for mining, quarrying, construction, agriculture, and seismic prospecting. Included in the booklet is a tabular summary which lists the properties of Hercules high explosives and a page index to a complete description of each type. The



other booklet describes the advantages and properties of Hercomite and Gelamite explosives. The Hercomite series are ammonium nitrate dynamites and the Gelamite series are semigelatins designed to economically replace gelatin or gelatin extra explosives.
Where to get: Hercules Powder Co., Wilmington, Del.

Subject: **Route Location**
Content: *Route Location and Surveying* is a new edition of a well-known work previously issued under the titles *Highway Curves and Earthwork* and *Highway Surveying and Planning*. In this new third edition the scope is broadened to include transportation systems such as railways, canals, pipe lines, airways, and airports. The book is authored by T. F. Hickerson, a member of the American Society of Civil Engineers. The volume is designed as a classroom text, a field manual, or a reference book in general engineering

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practice. Although emphasis has been placed on mathematical background of basic principles, adequate consideration is given to tables and procedures that expedite the work of the field party. Great attention has been given to the accuracy of the tables. Features of the book are: 1) Inclusion of airports in the transportation scheme. 2) Emphasis on the use of all kinds of maps in reconnaissance and preliminary studies. 3) Organization and duties of surveying parties. 4) Introduction of the unit circular curve. 5) Application of a table giving functions of the unit curve of length 100 feet to simplify computations of offsets and use of metric curves. 6) Simplified treatment of vertical parabolic curves and the transition spiral. 7) A complete mathematical background of spiraled compound curves. 8) A complete discussion of curve superelevation and spiral lengths. 9) New material pertaining to the widening of highway curves. 10) Algebraic background on stringlining of railroad curves, and 11) Simplified method for determining true bearing of a line from sun or star observations. The book contains many illustrations and charts. It is 543 pages in length.

Where to get: McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City, N. Y.

Subject: **Grader Attachments**

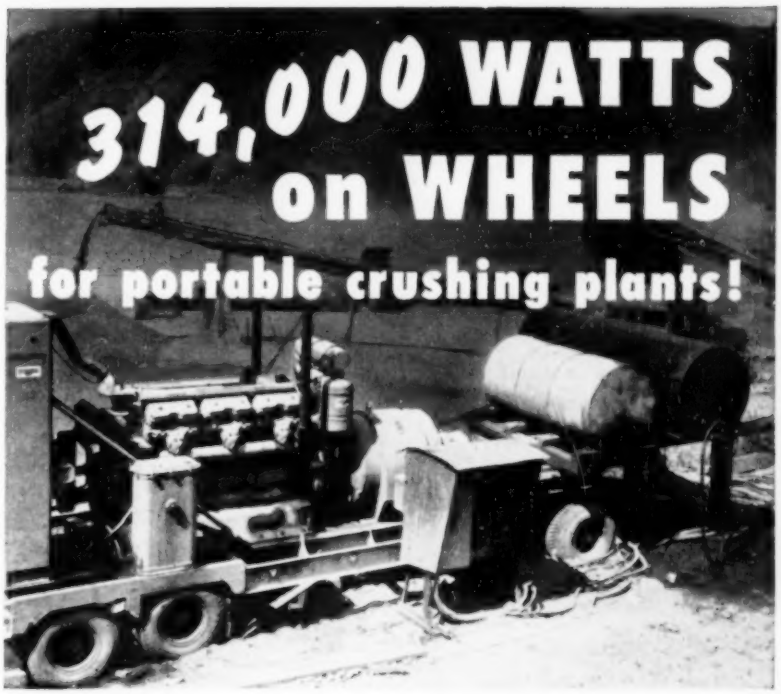
Content: A complete listing of 20 attachments for motor graders is now available in the booklet, *Attachments for your Caterpillar Motor Grader*. The eight-page booklet carries pictures and discussions concerning the usefulness of the attachments.

Where to get: Caterpillar Tractor Co., Peoria, Ill. (Form 30663)

Subject: **Model 320 Trencher**

Content: A new four-page bulletin on the Cleveland Model 320 trencher has just been published. The folder contains many photographs presenting the Model 320 in action under all types of job and weather conditions. Text briefly outlines advantages and special design features. Complete dimensions and specifications, including a table of optional cutting widths, are also contained in the two-color folder. Request for the folder should be written on your firm's business stationery.

Where to get: Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, O.



J. N. CONLEY, **well-known Portland, Ore., contractor has cut operating costs by driving his crushing plants with thrifty electric motors, *powered by a giant, trailer-mounted diesel generator.* Conley's heavy-duty LaCrosse Low Bed Trailer gives his 314,000 watt *generating* plant easy mobility — permits moving power unit completely out of range of abrasive dirt and dust from crushers. Trailer rolls from job-to-job in minimum lost-time . . . *eliminates* cost of building permanent foundations. Compactly arranged on the trailer deck are: 314-KW, generator, 500-HP. diesel engine, complete panel control board, and an 86-gal.-capacity radiator for engine cooling. A gas engine compressor with two 15-cu.-ft. air tanks supply air for starting the motor. Why not find out the advantages you can gain by mechanizing your operations with job-proved LaCrosse Trailers. Choice of 85 low-cost production models — from 6 to 67 tons capacity — flat, drop or tilting platforms. Also custom-built models for special needs. Write TODAY!**

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6—DW10 Caterpillar Scrapers and Tractors
3—DW15 Caterpillar Scrapers and Tractors

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2—Wooldridge TC IH2 15 yd.
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2—Bucyrus-Erie S113 12 yd.
1—Bucyrus-Erie SH5 6 yd.

TRACTORS

1—AC HD7W with Cable P.C.U.
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3—IHC TD18A with Cable P.C.U. and Bucyrus-Erie Angle Dozer or Bulldozer
1—IHC TD18 with Cable P.C.U. and Bucyrus-Bulldozer
1—IHC TD24 with Cable P.C.U. and Bucyrus Bulldozer
1—AC HD19 with P.C.U. and Pusher Block
1—AC HD19 with Pusher Block
6—AC HD15A with P.C.U. and Angle or Bulldozer
5—AC HD15 with P.C.U. and Angle or Bulldozer

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1—IHC 1-6
2—IHC 1D-9

CRANES, SHOVELS, DRAGLINES AND BACK HOES

1—388 BE G.M. Diesel Crane Dragline and Shovel
1—#4 NW Cat. Diesel Dragline and Crane
1—#25 NW G.M. Diesel Crane and Dragline
2—Lima 34E G.M. Diesel Crane Dragline and Backhoe
1—8E 15B Cat. Diesel Crane Dragline and Backhoe
1—Link Belt LS-52 Cat. Diesel Dragline and Backhoe
1—Link Belt LS-85 Cat. Diesel Crane and Dragline

TRUCK CRANES

2—Michigan TDL T-20 G.M. Diesel

MOTOR PATROLS

1—Galion Model 102 IHC Diesel
1—Galion Model 118 IHC Diesel
1—AC AD-3 G.M. Diesel
2—AC AD-40 G.M. Diesel
2—Caterpillar #12 Cat. Diesel

ROLLERS

1—Brass Model 67 Pneumatic Tired Roller
3—Heil Double Drum Sheeps Foot Rollers

DITCHING MACHINES

1—Cleveland Model 140-4 IHC Diesel Wheel Type
1—Barber Greene 44-C Gas Ladder Type

CONCRETE MIXERS

1—Jaeger 10DKK—Pneumatic Tired

BUCKETS

6—Hendrix TS 3/4 yd. Dragline Buckets
4—Owens 3/4 yd. Clam Shell Buckets
2—Owens 1 1/2 yd. Clam Shell Buckets
2—Hendrix TS 1 yd. Drag Line Buckets
2—Owens 1 yd. Clam Shell Buckets

TRUCKS & TRAILERS

1—Mack A40T Tractor and Dorsey-35 Ton Low Boy
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10—Dodge and Ford Trucks with Dump Bodies
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1—Gardner-Denver 210 Gas
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6—8" Well Point Pumps
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1—Haiss Belt Conveyor

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Notes from the manufacturers

Colorado Fuel and Iron Corp., New York, N. Y., recently announced that its board of directors elected H. C. Allington vice president in charge of sales of the eastern division. Allington's headquarters will be in New York City. Allington has been general manager of sales of the Wickwire Spencer Steel Div. of Colorado Fuel and Iron since October 1947. Before joining Wickwire Spencer Steel as a sales executive in 1943, Allington served as eastern district manager of the Sharpsville Boiler Works, and then as sales manager of the Oil Products Div. of American Machine and Metals, Inc. . . . Colorado Fuel and Iron Corp. also announced that L. A. Watts has been named general manager of sales of the eastern division. Watts has been assistant general manager of sales of the Wickwire Spencer Steel Div. of Colorado Fuel and Iron since January 1, 1951.

Cook Bros. Equipment Co., Los Angeles, Calif. manufacturers of heavy duty trucks and truck equipment, has formed a new division to handle Cook Bros. Series "MC" trucks, which are designed and engineered as crane and shovel carriers. This new division will be known as the Crane and Shovel Equipment Division. Robert H. Fox will act as sales director of this new division.

Detroit Diesel Engine Div. of General Motors Corp., Detroit, Mich., has appointed Ernest F. Bentley general sales manager. Bentley succeeds V. C. Genn who died in January. Bentley joined General Motors in 1934 as an engine designer with the Winton Engine Corp. of Cleveland, O., which later became the Cleveland Diesel Engine Div. He came to Detroit Diesel in 1940 as product engineer and prior to his present appointment was operations sales manager. He also served as staff assistant to the general manager, production buyer, supervisor of control materials, and manager of manufacturers' sales. Other appointments include Robert V. Baxley, as operations sales manager; John C. Campbell, as manager of manufacturers' sales; and Louis A. Steele,

TO ADVERTISE: All advertising in this section is payable in advance. Rate: $1.00 per line, or $12.00 per inch of 12 lines. Minimum charge $4.00. No discounts; no commissions. Please count your copy carefully to avoid delay. Each line contains 41 characters (34 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Be sure to enclose the correct amount of money with your order. Closing date—15th of preceding month. Example: January closes December 15th.

TO INQUIRE: Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

Page 625 Electric Walking Dragline, 150-ft. boom, 9-cu. yd. bucket. Excellent operating condition. Price $150,000 f.o.b. cars. Located Middle East. Available approximately May 1, 1953. Box 3504

Bucyrus-Erie 120-B Shovel serial no. 15941, with 5 yd. Esco dipper. In good operating condition. Location—West Coast. Price $100,000 F.O.B. cars.

Permanente Cement Co.
Permanente, California

4500 Manitowoc Dragline, Serial No. 4532, 120-ft. boom, 6-yd. Hendrix bucket. Practically new Caterpillar engine and radiator. 54-B Bucyrus-Erie Dragline, 3-yd. bucket and 90-ft. boom.
Located in New Mexico.

McGinnes Brothers
P.O. Box 2475 Houston, Texas
Phone OLive 2761

Bucyrus-Erie 5-W Walking Dragline, Diesel power, Serial No. 675, 120-ft. boom, two 5-yd. type AX buckets. Shipped from factory October 1945. Excellent condition. Box 3519

P. & H. Model 855, 2 yd. shovel serial #12661, 24' boom, 17' stick, 36" tracks. G. M. Model 6-71 Diesel engine. Electric starter, 1500 Watt Kohler light plant w/Wisconsin 4 cyl. water cooled engine. Machine new 10-22-48. Also dragline attachment with 50' boom and 2 yd. bucket. Price $35,000.

P. & H. Model 255, ¾ yd. shovel, serial #13301, 18' boom, 13' stick, 20" tracks. P. & H. supercharged Diesel engine 1500 Watt Kohler light plant, 125 volt, 1 cyl. air cooled engine. Machine new Sept. 1948. Completely rebuilt and has not been used since rebuilding. Excellent condition. Also some spare parts included. Price $12,000.

Lima Paymaster, ¾ yd., serial #2383. Powered by Caterpillar D318 Diesel engine. Engine has less than 2700 hours. Combination shovel, backhoe and dragline, complete less dragline bucket, 26" tracks. Unit in good condition. Price $10,000. Box 3539

Page 625 diesel walking dragline. 150 ft. boom, 9 cu. yd. bucket, 4 years old. Good operating condition. Price $150,000. Loaded on cars. Location Middle East. Box 3486

2—9-W Bucyrus Monighan Draglines.
1—5-W Bucyrus Monighan Dragline.
1—200-W Bucyrus Monighan Dragline.
1—120-B Bucyrus Elect. Dragline & Shovel.
1—44-B Bucyrus Dragline & Shovel.
1—9-W in Ohio—others in Wash. & Idaho.

J. A. TERTELING & SONS, INC.
Box 1428 Ph. 4-3576 Boise, Ida.

Marion type 7200 diesel walking dragline with 7-yd. Hendrix bucket and 120-ft. boom. Good condition. Location Middle West. Box 3522

Koehring model 1005 Diesel shovel, 2½ cu. yd. dipper. Delivered new, 1949. Located south central Missouri. Immediate delivery. Box 3493

"Quick-Way" Mdl. "J" (3 ton crane, ¼ cu. yd. shovel). International U-4 gasoline engine. Mounted on 4 x 6 tandem GMC truck with 7.50 x 20 tires. Equipped with shovel front and 20 ft. boom, dragline bucket, and all necessary equipment for dragline operation. RS-2247 (C). Sale price F.O.B. Louisville, Ky. $4,500. Box 3528

Northwest model 25; 6; 80D; 95. Manitowoc 6500; 4500 new — will rent. Bucyrus 54-B; Monighan 5W; 7W; 9W; 450.

A. W. Nevers Phone 32 Mt. Pleasant, Iowa

1 Bay City Model 65—1¼ yd. Shovel Cummins Diesel. 3 yrs. old. Overhauled March, 1953. Location, Indiana. Very good operating condition. Box 3533

Lorain Mdl. 50-I Dragline rated at 20 ton with maximum cwt. Crawlers overall length 12' 0" overall width 10' 6" with 30-in. pads, power lowering. Powered by Caterpillar D-318 diesel engine with fluid coupling (with 2205 hours) complete with 1 cu. yd. Hendrix type TS drag bucket. Sale price F.O.B. Evansville, Ind. $18,500. Box 3531

Bucyrus-Erie Model 15-B No. 59820 Combination 40' boom, dragline, clamshell and drag-shovel, diesel-powered, complete with drag and clam buckets. Excellent condition, located Springfield, Missouri. Write or phone Machinery & Supplies Company, 2000 Walnut Street, Kansas City, Missouri, Victor 5457.

Diesel shovel. Overhead, ⅝ yd. Oliver rubber tired tractor. Fast, maneuverable. 1½ years old. Good condition.

O. T. Cookingham, Jr. Red Hook, N. Y.
Phone 3891 or 6511

Bucyrus-Erie 54-B standard shovel front complete with shorter frame material. Original paint still good.

E. F. Craven Company
P.O. Box 538 Greensboro, N. C.
Phone 3-5521

Lorain Model No. 77 shovel with 1¾ cu. yd. Amsco bucket. Caterpillar Diesel engine. $3800 in repairs since use. Sale price F.O.B. Louisville, Ky. $13,900. Box 3526

¾ yd. Byers No. 83 clamshell, dragline (less bucket and backhoe attachments), new January, 1947, GM-371 engine, 40-ft. boom, 24-in. treads. In good operating condition. Box 3532

Northwest Model 105 combination shovel and crane. Serial No. 2238. Gasoline engine Twin City, S-0000 (C). Sale price F.O.B. Louisville, Ky. $3800. Box 3529

Bay City Crane, 1 cu. yd. Serial No. 1501 with 60-ft. boom and Cummins Diesel Motor No. HP-45179. F.O.B. Kentucky. $6,500.

Byers Crane, ¾ cu. yd. Serial No. 2072 with 50-ft. boom and Hercules Gas Motor No. YXC2-113227. F.O.B. Kentucky. $5,500.

Koehring Crane, ¾ cu. yd. Model 301, Serial No. 656 with 50-ft. boom and Wisconsin Gas Motor Type B2 No. 1194. F.O.B. Louisville, Kentucky. $5,500. Box 3537

Bucyrus-Erie Mdl. 22-B Base Machine only complete with fully enclosed steel cab. Independent power boom hoist. Caterpillar mounting 12 ft. ⅝ in. long overall, 9 ft. 4 in. wide overall, 26 in. wide tread. Powered by Buda K-428 6 cylinder gasoline engine with electric starter and 3450 lb. cast iron ballast. RS-394 (A). Sale price F.O.B. Evansville, Ind. $12,500. Box 3527

SHOVELS—CRANES—DRAGLINES

1950 38-B clam-drag GM diesel wide cats. Two Model 6 Northwest clam-drag 33" cats. Murphy Diesels 1952 models like new. Two Model 95 Northwest crane-drags 75 ft. booms. Murphy Diesels light plts-bkts—late models. Two new Model 25 shovels—wide cats-diesels.

Sales—Rentals

J. C. French, 226 Berry Pkwy., Park Ridge, Ill.
Tel. TAlcott 3-4927

Bucyrus-Erie Model H-3 Hydrocrane. Used less than four weeks. Complete with crane-clamshell equipment — ⅜ yd. clamshell bucket and backhoe equipment. Mounted on Chevrolet two ton, two speed axle truck. Price, $10,000 cash f.o.b. Albany, Ga.

Box 3524

Lorain Model No. 77 shovel with 2½ cu. yd. Amsco bucket. Caterpillar Diesel engine. $3800.00 in repairs since use. Sale Price F.O.B. Louisville, Ky. $13,900. Box 3526

10-B Bucyrus-Erie ⅝-yard Dragline, Serial 12427, powered by Allis- Chalmers gas. Complete with 28-ft. boom. ⅝-yard bucket. Completely overhauled. $5,000.00. Box 3518

10-B ⅝-yard Bucyrus-Erie Dragline, Serial 21575, with Buda gas power. 35-ft. boom. ⅝-yard Red Arch Bucket. Completely overhauled. In excellent shape. $6,000.00. Box 3517

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Sales about $50,000 year; A-1 equipment; for grading, crane service, excavating, etc.; good accounts; warehouse, offices, yard; about 96,000 sq. ft. land, wire fenced; radio dispatched equipment; heart industrial building area. Box 3540

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Bucyrus-Erie 15-B Miscellaneous Parts.
Northwest No. 25 and No. 6 Boom Point Sections.
Osgood 200 Shovel fronts.
International TD-18 Tractor & Hydraulic Dozer.
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ALLIS-CHALMERS HD-7W Tractor with Baker Grade-builder.
BUCYRUS-ERIE H-2 Hydrocrane.
BUCYRUS-ERIE 22-B Shovel with General Motors Diesel Engine.
HOUGH HLD Payloader.
For further details, write or call:
E. F. CRAVEN COMPANY
P. O. Box 538 Greensboro, N. C.
Phone 3-5521

Euclid Loader Model BV Cummins Diesel Power, condition practically new. Contact Mr. T. Kowski, Central Teaming Co., 8701 Burley Ave., Chicago 17, Ill.

ORANGE PEEL & SCRAPER BUCKETS
One new Hayward heavy standard 1 cu. yd. orange peel bucket. In original crating (1/3 off List Price)—$1500.
One Sauerman light weight 2 cu. yd. scraper bucket model US-790. Used only 12 hours in sand excavation (1/3 off)—$850.
R. H. CLARK EQUIPMENT CO., INC.
P. O. Box 2566 Mulberry, Florida
Phone — 2541 & 2861

One new shovel attachment complete for 304-1A Koehring Dragline-Clamshell, ¾ yard capacity. Serial No. C-5110. Price: F.O.B. Omaha, Nebraska. $3,200.00. Subject to prior sale.
Box 3521

D1300 Caterpillar Engine Gas electric starting, complete. Serial No. 4S-11242. New July, 1951. Never used. The American Fire Clay & Products Co., P.O. Box 157, Canfield, O.

Model 29-T Bucyrus-Erie Blast Hole Drill with tools for 9-ft. diameter holes, gasoline powered, approximately six years old and in good condition. Located: Central Pennsylvania.
Box 3520

Slightly used Bucyrus-Erie No. 8 Bit Sharpener, oil fired heating furnace and bit quenching tank with tilting racks. For price and other details write Box 3534.

POSITION WANTED

As engine rebuilder with coal mining company. Have my own equipment for engines up to 5¾ bore, and portable shaft grinder up to 3⅛-in. diameter. Can also operate shovels and draglines. Have 30 years experience in open pit mining.
Box 3523

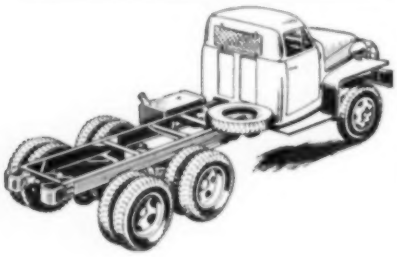
Superintendent available. 30 years experience and qualifications covering hi-ways, airports, large sewers, water lines, heavy and light excavating; all types. Know cost and modern equipment. Sober, honest, and reliable.
Box 3535

HELP WANTED

Position vacant. Superintendent: Man familiar with open pit mining with bulldozer, scraper, shovel, for New Caledonia. Some knowledge of French preferred. Must be able to teach operators. Liberal pay and bonus. Box 3538

as industrial sales manager. Baxley, former contractors' equipment sales manager, started with General Motors as a sales engineer in 1939 and a year later joined Detroit Diesel as an experimental engineer. Campbell came to the Division from Frigidaire in 1942 and has served as advertising and sales promotion manager and industrial sales manager. Steele has been with Detroit Diesel since 1942, serving as distribution manager, manager of the contract and order section, and automotive and tractor sales manager.

Harnischfeger Corp., Milwaukee, Wis., has appointed William S. Burdick vice president in charge of engineering. Burdick is a veteran of more than 20 years' service with P & H. He joined the engineering department in 1929, where he specialized in excavator design. In that capacity his work included a number of important contributions to the development of P & H excavator design. He has served as sales manager for large excavators and as manager of the Chicago district. He holds a graduate M.E. degree from the University of Wisconsin.



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MILITARY TRUCK PARTS

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WM. O. HENSLEY TRUCK PARTS
P.O. BOX 747 1472 WABASH AVE.
TERRE HAUTE, INDIANA

Frank G. Hough Co., Libertyville, Ill., announces the appointment of G. A. Tamblyn as sales manager. Tamblyn has been with the company 11 years and has been assistant sales manager since 1948.

C. S. Johnson Co., Champaign, Ill., has appointed Cook Brothers Equipment Co., Los Angeles, Calif., distributor in the State of Arizona. A subsidiary of the Koehring Co. of Milwaukee, Wis., the Johnson Co. manufactures a complete line of concrete batching and cement handling equipment, including concrete and clamshell buckets. Located at 1815 North Broadway, Los Angeles, Cook Brothers Co. succeeds Shaw Sales and Service Co., Los Angeles, and the Neil B. McGinnis Co. of Phoenix, Ariz., as the authorized C. S. Johnson distributor in Arizona.

R. G. LeTourneau Inc., Peoria, Ill. has appointed John W. Schoen vice president and general sales manager. Schoen will direct the company's sales division as well as other related departments. A graduate of Iowa University, where he studied business administration, Schoen was with the firm of Logan Long of Chicago, Ill. From 1940 through 1943 he served in various sales positions with the E. R. Squibb Pharmaceutical Co. and later was associated with the Firestone Tire and Rubber Co. In 1943 he joined the LaPlante-Choate Co., a Cedar Rapids, Ia. manufacturer of construction machinery and rose to vice president in charge of sales, a position he held for the past four years. Early this year the Allis-Chalmers Co. acquired the LaPlante-Choate properties and Schoen resigned to become consultant for the David Brown Industries, a British manufacturer of construction machinery. He replaces R. E. McCluskey who recently resigned from the LeTourneau Co.

Stewart-Warner Corp., Instrument Division, Chicago, Ill., has announced three new distributor appointments. They will handle distribution of the instrument line, consisting of speedometers, tachometers, gauges, fuel pumps, Motor Minders, and other products to the automotive, electrical, marine, industrial, and farm equipment jobbers in their respective territories, as well as certain types of original equipment users. The three new distributors are The Alemite Co., 64 Cummington St., Boston 15, Mass.; Stewart-Warner Alemite Sales Co., Locust St., Hartford, Conn., and The Alemite Co., Inc., 622 Cherry St., Des Moines, Iowa.

6 x 36 WS PREformed Right Lang Lay
Monarch Whyte Strand with IWRC

What's unusual about this machine?

This is a 6 x 36 PREformed rope, made up of 265 wires. That means 265 individual moving parts.

Because any wire rope is a complicated piece of machinery, it must be precision built.

There are 8 different sizes of wire in this rope — each drawn to exacting specifications for material and size.

Outside wires are one size. Inside wires are another. Core and filler wires are still other sizes.

All wires are cold-drawn to precise diameters so they will fit with snug uniformity into the structure of each strand.

Each wire is protected with lubricant applied during fabrication of the rope.

Macwhyte makes a thousand and one ropes to meet the needs of every type of equipment. Each is built with the exacting care that long, low-cost service demands.

Prompt recommendations from Macwhyte engineers are readily available without obligation.

MACWHYTE WIRE ROPE

THE RIGHT ROPE
FOR YOUR EQUIPMENT

Ask for G-15 Handbook

MACWHYTE COMPANY
KENOSHA, WIS.

MACWHYTE COMPANY
2905 Fourteenth Avenue, Kenosha, Wis.
Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope and Wire Rope Assemblies. Mill depots: New York • Pittsburgh • Chicago • St. Paul • Fort Worth • Portland • Seattle • San Francisco • Los Angeles • Distributors throughout U.S.A.

Bought one DW21, reordered 6 more in 14 months!

DAVE GUSTAFSON & CO., INC.
HIGHWAY CONTRACTORS

502 EAST SIXTH — PHONE 8-3851 — SIOUX FALLS, S. D.

January 9, 1953

Caterpillar Tractor Co.
Peoria,
Illinois

Gentlemen:

Our experience in the contracting business dates back to 1926. Our original equipment consisted of one Caterpillar Model Sixty Tractor.

When Caterpillar came out with the DW10 rubber-tired Tractor, we bought two of these units with scrapers as we felt that moving dirt on rubber-tired rigs was a better way of getting the job done. Caterpillar didn't let us down!

In July of 1951 we bought our first DW21 Tractor-Scraper outfit. The performance of this machine was so good that we added two more units in February 1952. Since that time we have purchased four more DW21 Tractor-Scraper outfits; two in April and two more in September of 1952 for our road building projects in South Dakota, because we have found that this is the cheapest method known today for handling dirt on projects such as ours.

When we bought the two DW21 Tractor-Scraper units in September we had just started work on a sub-contract from Peter Kiewit Sons Co. for grade construction of the "four lane highway" from Weaver Airforce Base to Rapid City, South Dakota, consisting of 650,000 cubic yards to be moved in 90 calendar days. Hauls on this job ranged from 400 feet up to 2 1/4 miles one way. Working a single ten hour shift, six days a week our DW21s really put it across on time.

In addition to our DW21s, we have ten Caterpillar crawler Tractors, and five Caterpillar No. 12 Motor Graders.

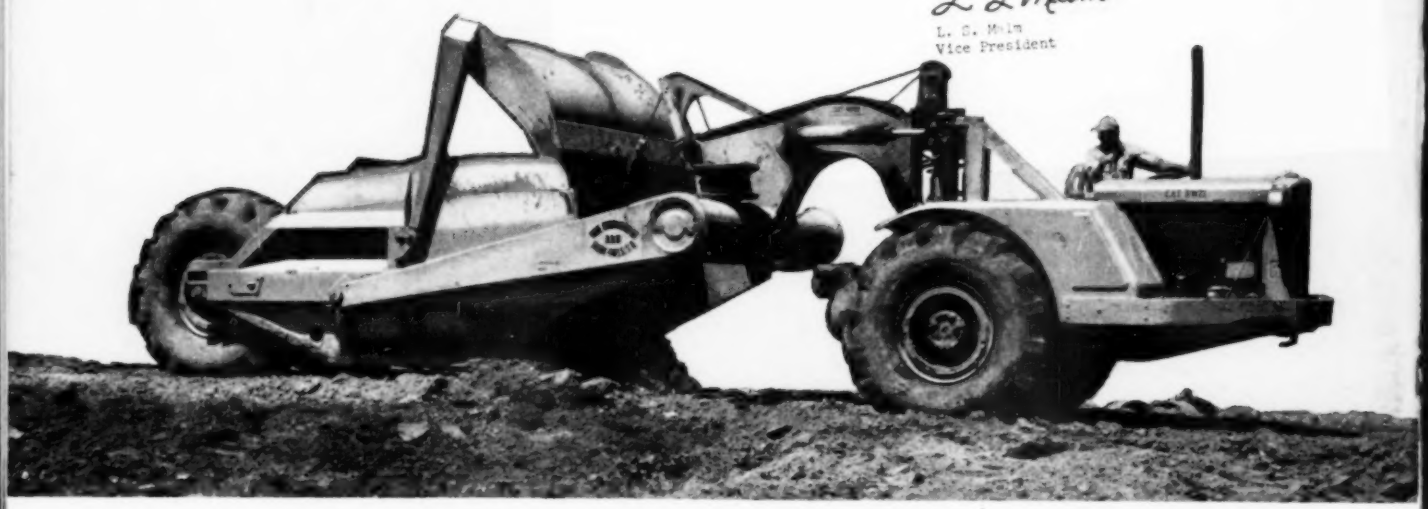
Our DW21s have the power and stamina to stay on the job and keep the dirt "moving" without costly breakdowns and delays. We feel that Caterpillar performance is second to none and is backed up by the best parts and service facilities to be found.

Very truly yours,

DAVE GUSTAFSON & CO.

L. S. Malm

L. S. Malm
Vice President



Dave Gustafson & Co., Inc., of Sioux Falls, S. D., bought its first Caterpillar DW21 and Scraper in July, 1951. By September, 1952, it had a fleet of 7 of these earth-eating Cat* units.

Why?

L. S. Malm, vice president of the company, has a telling explanation:

"We have found this is the cheapest method known today for handling dirt on projects such as ours."

Don't keep throwing good money after bad on less capable earthmoving equipment. Have your Caterpillar Dealer demonstrate the money-saving advantages of having DW21s on your side.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks — ®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE